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American Mining and Metallurgy from a Foreign Standpoint.

Notes of a Tour of Observation, by Professor F. STAPFF, of Sweden, Special Correspondent of THE ENGINEERING AND MINING JOURNAL.

V.

THE PUDDLING PROCESS.

SINGLE puddling furnaces of customary construction and size are most generally used, but at some places, such as Johnstown, the Laclede rolling mill (St. Louis), etc., double furnaces are also employed. The charges of single puddling furnaces vary at different works between 400 and 475 pounds; those of the double ones at Johnstown were 1,000 to 1,050 pounds, five to six charges being there made in a day. At the Cincinnati Railroad Iron Works, forty-three bushels of bituminous coal was stated to be used for puddling a ton of iron in furnaces of common style; consequently about 1½ tons of coal would be wanted for a ton of iron, if a bushel of coal is supposed to weigh 78 pounds. The greater part of the puddling furnaces are lined with Lake Champlain and Iron Mountain ores. Having spent comparatively little attention and time upon the study of puddling works, I shall confine myself to the communication of some observations made, and statements received about two innovations upon this field, viz: the Ellershausen process, and Mr. DANKS's improved revolving puddling furnace.

The Ellershausen Process is practiced at Sligo, and at SCHONBERGHER & BLAIR'S establishment, Pittsburgh. You know that the original plan of ELLERSHAUSEN was to decarbonize pig iron by putting it (molten) in contact with pulverized iron ore. Though this scheme has not found a practical solution, upon the whole, nevertheless, it included a method to fix a certain quantity of pulverized ore firmly and regularly in the pig iron. This powdering of pig iron with iron ore is the Ellershausen process, in its present stage. Ingots prepared in the manner here intimated are subjected to the common puddling process, in which the particles of iron ore, mixed with the pig iron, act upon its carbon, etc., quite in the same direction as the oxides of iron (existing in the lining and cinders of puddling furnaces) do during customary puddling. That the reaction of the iron ore upon the pig iron must take place in a shorter time, more energetically, more completely, more uniformly, and with less handiwork, when the ore is so thoroughly and firmly mixed with and fixed to the pig iron, that each drop of iron melting down comes into intimate contact with the ore. This is the merit of the Ellershausen process in its present limited application. At Sligo, the Ellershausen ingots are made from pig iron remelted in a reverberatory furnace; at Mr. SCHONBERGHER'S establishment, directly from the blast furnaces. Before the two furnaces in SCHONBERGHER & BLAIR'S establishment, the Ellershausen apparatus was fixed at the side of the common sand moulds, but at a lower level. The castings from either furnace can be directed to the Ellershausen apparatus or to the sand moulds, totally or partially. The apparatus consists of a ring-shaped iron-slab table, (A A, FIG. 1), which, by the arms *(f f,)* is connected with the vertical shaft *(a)*. On the lower side of the round-table, and close to its periphery, a cog-wheel is fixed, geared with a small cog-wheel on the horizontal shaft, (D), by the rotation of which the table (A A) is turned (in the direction of the arrow). The annular turn-table slopes several inches towards its outer rim. Towards the shaft it is bordered by the vertical edge plate *(b b)*, outside by the loose cast iron sectors, *(c c c)*, which are easily removed from or put on the table, and joined together by the bolts *(d d d)*. Sixty or seventy cast-iron slabs, *(e e e)*, thicker at their lower sides, are radially set in between the edges *(b* and *c)* of the turn-table, dividing it into open chests, with inclined bottoms, of say two to three feet in length, six to nine inches in breadth, and nine inches in depth. Immediately above these chests terminates the gutter (B) from the blast furnaces, and several feet of the mill funnel (C) is fixed above the turn-table. The mill funnel (C) has a slit in its bottom, radial to the turn-table, and having the same length as the chests. The width of this opening can easily be varied by an attached mechanism of simple construction.

The annular turn-table is covered several inches thick with a layer of coarse-grained ore powder (Lake Champlain), which, remaining after preceding operations, always keeps an elevated temperature. The cast-iron slabs, *(e e e)*, are kept in their position by being submerged in the ore powder. The funnel (C) is filled with the same ore powder (of the size of lentils and finer), which has been moistened by a little petroleum. When an operation is to take place, the turn-table is put in motion, the slit of the funnel (C) conveniently opened, and the casting from the blast furnace is spread over the chests through the gutter (B). It is easily understood that the sheets of iron deposited in the chests are successively covered with a thin layer of ore powder when passing below the funnel, and that the ore-layers are covered with a second sheet of iron, when the chests pass again under the gutter, and so on. But as the pig iron is yet fluid when passing under the ore funnel, the grains of ore are cemented on the surface of the iron, and each following stratum of iron partially enveloping the grains projecting from the next lower one, the two succeeding iron layers are partially soldered together. The result of the operation is ingots, composed of just as many alternating layers of ore and pig iron as the turn-table made rotations during the casting. The quantity of ore mixed with a certain quantity of pig iron depends upon the quantity of iron cast during a certain time, the number of revolutions of the table during this time, and the quantity of ore powder simultaneously running out of the funnel. I was told that about ten per cent. of ore was fixed in the iron, but I imagine that a good deal of it falls out again afterwards, while the ingots are handled. Four tons of cast iron were operated upon at one time, and the ingots, of about three inches thickness at one end and five or six inches at the other end, were composed of eight or nine alternating strata.

The process takes place very quietly. Some stars of burning iron are ejected from the gutter, and the chests newly filled, exactly as at common castings. A feeble boiling of the liquid iron in the chests may be observed, and much smoke is developed from the petroleum, distilling and burning with a yellow flame. Indeed, all Pittsburgh smells of the Ellershausen process.

As soon as the ingots have solidified, the loose outer border of the turning-table is removed in pieces, and the ingots are successively taken out. The ore powder falling out of them is gathered, and, together with a fresh supply, used for a succeeding operation. If necessary, it is previously submitted to a cleansing process by washing, sifting, and drying it over the hot ingots.

The iron was grey and grey-mottled when cast in sand moulds; when cast in the Ellershausen ingots it was white, and of fine crystalline fracture, like other chilled iron. The chemical reaction of the oxides of iron on the ore upon the carbon in the pig iron can only be a very slight one during the Ellershausen casting process, the time for such a reaction being very limited, and the surface of all ore-grains touching the iron very small when compared with the great bulk of iron which the ore is intended to work upon. Reactions of the ore upon the iron cannot easily be imagined to take place anywhere else than at the points of contact between the ore-grains and the iron. The chemical effect of the petroleum upon the iron, the ore, or the process in general, is not easily understood—the less, as the quantity of petroleum used is trifling when compared with that of the ore or iron. The hypothesis was advanced that the coal residuum remaining in the ore after the lighter substances in the petroleum had evaporated, would reduce the ore when the ingots were melted in the puddling furnace. But, if this was the case, the chemical effect of the Ellershausen process would itself be at the same time greatly diminished. If the petroleum has any influence upon the result of the process, this influence, it seems to me, should rather be considered as a mere mechanical one, a slight cooking being occasioned by the petroleum vapors, in consequence of which, perhaps, a more spongy iron is obtained.

I have already pointed out that small particles of ore coming in direct contact with almost every drop of the iron melting down in the puddling furnace, must exercise a favorable influence upon the abridgment of the puddling process, upon the saving of fuel, wages, and materials, and upon the quality and uniformity of the product. But I cannot understand how sand or coke powder can supply the place of ore in the Ellershausen process to advantage. Nevertheless, those materials were said to have been successfully substituted at one of the Pittsburgh establishments.

Dr. WUTH, who has analyzed many raw materials subjected to the Ellershausen process and many of its products, stated that sulphur was, but phosphorus was not, removed by this process, (viz., by the puddling of ingots prepared by it). But its final results are very satisfactory. The iron produced is of better quality than iron puddled from the same pig without previous preparations. A very distinct and practical argument for this assertion has been delivered by Mr. SCHONBERGHER & BLAIR'S establishment, where horse-shoes and thin sheets are now made directly from the mock bars of puddled iron, which previously went through the Ellershausen process. Before the installation of this process, the articles mentioned were fabricated out of re-puddled scrap iron.

It was stated at Messrs. SCHONBERGHER & Co.'s establishment,

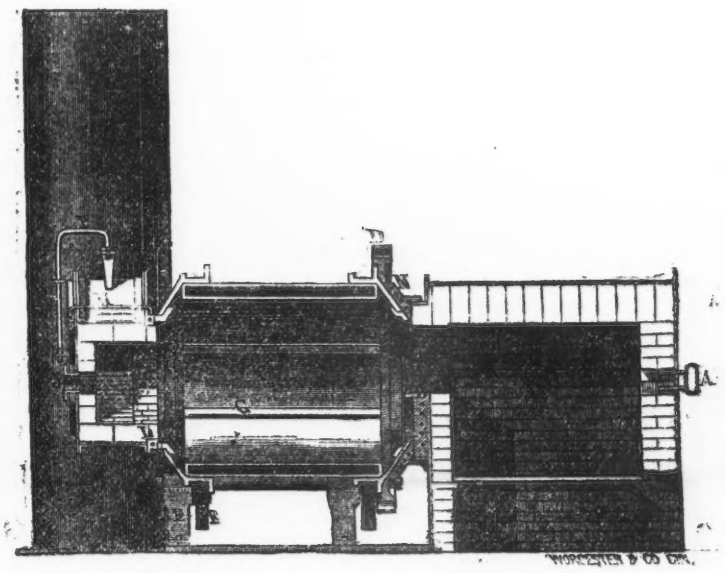


Fig. 2.--REVOLVING PUDDLING FURNACE.

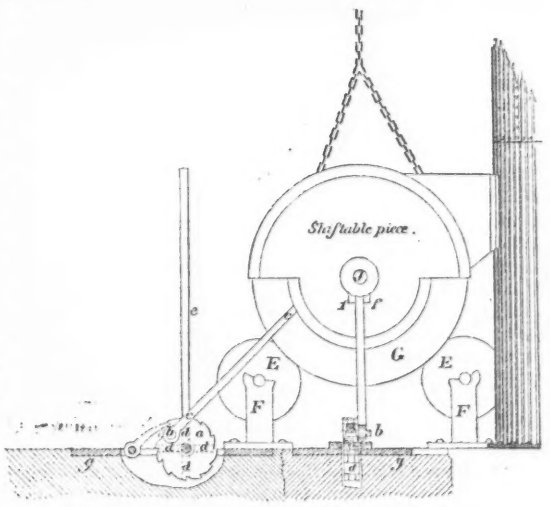


Fig. 3.--REVOLVING PUDDLING FURNACE. Cross Section.

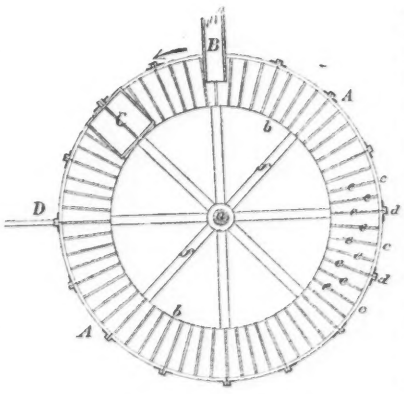


Fig. 1.--ELLERSHAUSEN APPARATUS.

that the Ellershausen process caused a saving of one-half the time formerly necessary for the puddling process, and that it reduced the loss of iron seven to eight per cent. At Sligo, the Ellershausen apparatus is arranged before a reverberatory furnace of common construction, but on a lower level, so that the pig iron from the reverberatory furnace can be directly turned into the chests upon the turn-table. The capacity of the reverberatory furnace is five tons, but its common charge is only three to four tons of grey iron, five charges (and Ellershausen operations) being made in twelve hours. It is but natural that the quality of the iron must be improved by re-smelting, independently of the effect of the Ellershausen process.

The apparatus at Sligo differs in some details from that at Mr. SCHONBERGHER'S works. Twenty-four loose cast-iron chests are put on the turn-table, forming a closed ring around its shaft. These chests are furnished with trunnions, to facilitate their handling. One side of every chest laps over the adjoining side of the following one, so that the intervals between them are covered from above. By two or three loose cast-iron slabs each chest is divided into three or four compartments, stretching radially or tangentially over the turn-table. The gutter from the reverberatory furnace terminates above another gutter in transverse position, by which the iron is conducted upon the table in a thin stream, quite as broad as the chests are long. Pure hematite ores, which have been washed, crushed and sifted, are here used as bottom-cover in the chests and as ingredients of the process. By repeated use they soon get burnt and red. A bushel of these ore-grains is the charge to be fixed in three tons of iron. Calculation proves that this quantity corresponds to about three to four per cent. of the weight of the iron treated. Here, too, the ore is moistened with a small quantity of petroleum. The results obtained at Sligo are, highly improved quality of the iron made, reduction of the puddling expenses to two-thirds of the common ones, (the time for puddling charges of ordinary weight being abridged one-third, or the weight of charges puddled in the customary time being increased from four hundred pounds to six hundred pounds) and diminution of the loss of iron.

Mr. DANKS' *improved revolving puddling furnace* (patented Nov. 1868, and assayed to himself and Messrs. LEWIS WORTHINGTON and J. C. BUTLER) has been in use at the Cincinnati Railroad Iron-works since May 1868. It is constructed like a furnace of this kind, which some years ago was described and illustrated in the *Revue Universelle.** As I have no access to this paper at present, I cannot state the volume and number which contain this description and drawing. Mr. DANKS has, however, made many improvements in the construction of details, thereby improving the practicability of this furnace very materially.

FIG. 2 gives a sectional view of Mr. DANKS' furnace. The following is the description, as given in his circular :—A, windpipe over fire ; B, bridge-plate, with wrought-iron pipes cast in, to convey water or other cooling fluid ; C, grate-bars ; D, cog-wheel ; E, carrying-roller ; F, pillar-block ; G, hollow ribs, for the double purpose of holding the lining and keeping it cool, being open outward ; H, ring on end of cylinder ; I, crane for carrying the shiftable piece which performs the functions of door and flue ; J, stopper-hole ; K, ring on end of cylinder ; L, ring on shiftable piece, with water-pipe in it ; M, pipe to convey water to cells on front of shiftable piece, to ring of same ; N, water-collar, surrounding the bridge-end of cylinder, to keep it cool.

The furnace in use at the Cincinnati Railway Iron Works at present has been altered in some points. These are, so far as I have observed, the following :—The ash-pit below the grate *(C)* is closed, and a blast is conducted by a windpipe below the grate. The blast entering through the wind-pipe *(A)*, just below the grate, can so be regulated, that the flame passing over the fire-bridge *(B)* is either oxidizing, reducing, or neutral. The puddling cylinder *(G)* is wrapped with a hollow cloak of sheet iron, through which a cooling water-current constantly flows. The collar *(K)*, on end of cylinder, is furnished with a hole, entering the cylinder close over the lining. It is designed for drawing off the cinders, and commonly stopped with a clay-stopper.

The "shiftable piece" *(J L M)*, which performs the functions of door and flue, is by a chain running over pulleys, so that it is easily drawn up or to the side. The points for fixing the chain to the shiftable piece are so chosen, that it takes the right position to the puddling furnace and to the chimney, when conveniently lowered. The crane *(J)*, as indicated in the cut, is no more in use. The front-side and the upper part of the shiftable piece are cooled by a current of water, which enters the pipe *(M)* through a rubber-hose.

To fix the shiftable piece to the furnace and the chimney as closely as possible, and yet so that it can easily be removed, Mr. DANKS has constructed a special mechanism, which works so well, and is so simple, that I have thought it worth sketching in separate form.

FIG. 3 shows a cross-section. On the side and front of the shiftable piece two small-balance-wheels *(a)*, resting on the bottom-plates *(g g)*, are fitted in the ground. Each one of them is provided with a small crank-pin *(b)*, which is easily set through the eye of a loose rod *(c)*, reclining against the shiftable piece. By a loose lever-rod *(e)*, stuck through any of the holes *(d d)*, the balance-wheel may be turned, and the rod *(c)* pushed out against the shiftable piece, thus pressing it against the chimney or the revolving furnace. The projections on the shiftable piece prevent the rods from sliding upon it, and ratchets and pawls prevent the balance wheels from turning back. As soon as these hooks are released, the rods *(c c)* catch no longer ; they can be taken away, and then the place before the puddling furnace is clear, the wheels *(a a)* and the pawls projecting only very little from the ground. The lining of the puddling is about six inches thick, and composed of crusted cinders and Missouri ores. I cannot give the exact proportions of these and possible other ingredients, nor the *modus operandi* for burning the lining into the furnace. The lining stands well, and its durability is not diminished when the furnace is by turns cooled and reheated.

From the cuts it can easily be seen that the furnace *(G)* revolves upon the rollers *(E)* between the fire-place on one side and the shiftable piece on the other one, the motion being communicated to the cylinder from a small steam engine on its side, by means of a crank-rod, crank, and a couple of cog-wheels, the last of which *(D)* are visible in the cut. The flame from the fire-place spreads through the puddling-cylinder and the shiftable piece to the chimney, heating the inside surface of the former very uniformly. The iron and cinders in the revolving puddling furnace are stirred up thoroughly, and so the chief work of the puddler is done by the steam engine. Superfluous cinders are discharged by the cinder-hole already mentioned. The progress of the operation is observed by the hole *(J)*, and tools necessary for making the balls are also introduced by this hole. For removing the balls, repairing the lining, and charging, the shiftable piece *(J L M)* has to be removed. On one side of the puddling furnace, a cupola furnace with thirteen tuyers is placed, in which forty-three tons of iron can be melted daily. The molten iron is handed over to the puddling furnace by means of a crane. When I visited the place, this cupola furnace was not in use, the puddling furnace then being charged with so called stove-scrap.

Mr. DANKS says about his furnace : "The quality of the product from this furnace is superior to any produced by any other style of puddling from the same quality of metal ; and iron or steel can be made at pleasure. We first refine the iron with any desirable flux in the furnace, and then draw off the cinders and impurities before the boiling takes place, and finish as desired."

"A perfectly uniform product is easily produced, as the whole charge is equally worked, and is of uniform temperature. No tools nor man-power to manipulate the iron or steel is required ; there is no loss in yield, but a gain of three to eight per cent. over the metal charged. It requires about one-half hour's time for each charge, after being melted, until the charge is drawn, and, when melted, metal is charged, fifteen to twenty charges per day, of ten hours, can be easily made. The weight of each charge is only limited by the size of the furnace and the ability to handle the ball, as one ball in a charge is preferable to a greater number ; but three or more balls can be made at each charge.

"The furnaces consume about the same amount of coal per day as the old style of puddling furnaces, but very easily produce double the amount of iron ; and, by charging melted metal, three or four times the amount. The quality of metal will influence the quality and quantity of product.

"The cost of constructing each furnace is about double the amount of that for an ordinary puddling furnace ; but in proportion to the product. The first are less costly."

To the preceding, some observations of my own may be added.

As soon as the balls from a previous operation had been withdrawn, the furnace, containing still a small quantity of liquid cinders, was put in slow rotation, and at the same time lining matter was put in shovel by shovel, care being taken that hollow places in the lining were filled, and the puddling surface evened as much as possible. This operation was finished in a few minutes. Then the charge of 467 pounds of stove scrap was thrown into the furnace and melted down, (the shiftable piece being fitted in the right position), by a smoky reducing flame. During this period, the furnace was turned now and then slowly, and very little at once. Afterwards the flame was made clear, (neutral or oxidizing), and, the melting being completed, the greatest part of the cinders was let off by the cinder-hole, the cylinder being kept in a position which allowed the cinders, but not the iron, to run out. Now the furnace was steadily and rapidly revolved, the cooking period having begun about thirty minutes after the charging. When the cooking was over, the first ball was formed with common tools, the furnace being kept in a slight motion when convenient for the handling of the ball. The shiftable piece being removed, the ball was taken out and carried to the squeezer. In the same way two other balls were formed. Immediately after taking out the last ball the furnace lining was repaired as described above, and a new operation begun. The time necessary for the whole operation was not quite an hour. Two men watched the furnace, one of them the puddler, the other the fireman, engineer and helpmate. They had very easy work, and I think Mr. DANKS was quite right when he asserted that two men would comfortably watch two furnaces situated close together. Out of 467 pounds of stove scrap, 490 pounds of blooms were stated to be received, (about five per cent. increase). Daily ten charges are made when stove scrap, and fifteen charges when melted pig iron is used. Out of the latter blooms were said to be made ten per cent. heavier than the pig iron charged. As this figure approaches the limits of *possibility*,* one must suppose that some iron is reduced by *direct* reaction of the smoky flame at the beginning of the operation upon the ore and cinders. During a period of ten weeks, sixty pounds of iron ore to one ton of iron had been used for lining the furnace. Twenty-six bushels of bituminous coal were necessary for puddling one ton (heating coal included,) whilst the consume in a common puddling furnace is forty-three bushels. As each of Mr. DANKS's improved revolving puddling furnaces was supposed to save 100 pounds weekly, it seems rather strange that the Cincinnati railway iron works can be content to draw this profit only from *one* DANKS furnace, it being in their power to multiply the profit by supplying the place of *all* their old puddling furnaces, the sooner the better, with half as many furnaces of Mr. DANKS's patent. The workmen were said to be very antagonistic to the innovation, as they feared a reduction of their wages, and at present Mr. DANKS's own brother works before the experimental furnace.

One of Mr. DANKS's furnaces was said to cost about $5,000, cupola, furnace and machinery included ; but the costs of repair are less than at furnaces of the old style.

[TO BE CONTINUED.]

* REMARK.—Some ten or twelve years ago I saw at the Finspong Iron Works, in Sweden, a revolving puddling-furnace of another construction, which, after its inventor and shape, was named "Oestlund's gryta" kettle.) If I recollect right, it was afterwards abandoned.

* REMARK.—Granting that all the carbon in the pig iron has been used for the reduction of iron from the furnace lining and cinders.

The Methods of Gas Purification.

By Professor C. F. CHANDLER : A Report to the Metropolitan Board of Health.

II.

COMPARATIVE ADVANTAGES OF THE DIFFERENT METHODS.

THE lime methods effectually remove the carbonic acid, and reduce the sulphur compounds to a minimum. Were there no objections to the use of dry lime on the score of cost or offensiveness, I think this agent would be generally preferred. Lime was first abandoned on account of the nuisance which it occasioned, but the iron oxides are now actually preferred by the European gas engineers, on account of their greater economy. Mr. KING, the engineer of the Liverpool works, assured me that the oxide of iron purification, which he had used exclusively for the past seven or eight years, cost less than half as much as the dry lime process used previously.

Two objections are urged against the iron methods by those who are prejudiced in favor of lime. First, they do not remove carbonic acid ; second, it is claimed that they do not remove the sulphur compounds as completely as lime.

The first is generally conceded to be true. But the only objection to carbonic acid is, that it reduces the illuminating power of the gas. One per cent. of carbonic acid diminishes the illuminating power five per cent. The average quantity of carbonic acid is, say two and one-half per cent. ; then the illuminating power of the gas will suffer to the extent of twelve and one-half per cent., or one-eighth.

There are two ways in which this difficulty can be effectually met. First, by using better coals for making the gas, or adding a few pounds of rich cannel, or some other enriching material, to the ordinary gas coals ; or, secondly, by taking less gas from the coal. The last gas drawn from the coal is always inferior to that which comes off first. Mr. A. BUHE, already referred to, says : "It has become more and more the custom to leave the carbonic acid in the gas, and to neutralize its bad influence on the illuminating power by taking less gas from the coal, thus getting a better gas." Dr. SCHILLING says, "Carbonic acid is of no consequence to the consumer ; cannel coal is the remedy."

The second objection to the iron processes is the alleged imperfect removal of the sulphur compounds. None of the methods in use entirely remove the sulphur from the gas. The question arises, therefore, how much sulphur can be safely left in the gas. The English Parliament has answered this question, by fixing the limit at twenty grains of sulphur to one hundred cubic feet of gas ; and to see that the companies come within this limit, chemists are appointed whose duty it is to analyze the gas and to report its quality. I have before me the report of Dr. LETHEBY for the months of January, February and March, 1869. He states the grains of sulphur found in one hundred cubic feet of gas to be as follows :

	Max.	Min.	Average.
City of London Gaslight and Coke Company..	18.92	11.70	15.00
The Gaslight and Coke Company.....	24.15	15.75	19.49
Great Central Gas Consumers' Company.....	24.00	7.03	12.28

From this it will be seen that the gas of London, although purified by iron, does not average twenty grains of sulphur in one hundred cubic feet. With regard to the Paris gas, which is purified by LAMING'S oxide of iron mixture, Professor J. LAWRENCE SMITH, one of the United States Commissioners to the French Exposition of 1867, who is the president of the Louisville Gas Company, has given us a very decided opinion. On page 88 of his report, which was published by the United States government, he says : "The gas of these works is most thoroughly purified, and the dealers in silks and other delicate fabrics, who a few years ago always suffered more or less loss from the results of the combustion of impure gas acting on their fabrics, now no longer suffer from this cause."

Dr. LETHEBY (*Journal of Gas Lighting*, 1869, page 83) has argued that twenty grains of sulphur should not be left in the gas, and proposes, therefore, as the most effective method of purifying gas, this treatment : First, with ammoniacal liquor ; second, with hydrated oxide of iron ; third, with dry lime. As the iron will have removed the sulphuretted hydrogen, the refuse lime will not be offensive, while it will effectually remove the carbonic acid. This system of purification will, he thinks, reduce the quantity of sulphur to ten or twelve grains per one hundred cubic feet. Most gas engineers and chemists differ from Dr. LETHEBY on this point, however. Dr. SCHILLING says, in his *Journal für Gas Beleuchtung* for 1869, page 484 : "Twenty grains of sulphur in one hundred cubic feet of gas are entirely unobjectionable. Under the most favorable circumstances, with no ventilation whatever, it would give the atmosphere of a room only one part of sulphurous acid in five hundred thousand parts of air." Professor WILLIAM ODLING, secretary of the London Chemical Society, has spoken very clearly on this subject in his lecture to the British Association of Gas Managers, June 2, 1868, which appears in the *Journal of Gas Lighting* for 1869, page 81, and I have found that his views are those generally entertained by chemists and gas engineers. He said :

"I am altogether at issue with the public when they maintain that the sulphur of gas produces, by its combustion, oil of vitriol, or that the amount of sulphur ordinarily contained in gas is of any consequence

whatever, and a little consideration will, I think, satisfy you of the soundness of this position. We will assume that coal gas contains not twenty, but forty grains of sulphur in one hundred feet, a quantity, at any rate, greatly exceeding the reality. Now, making another extravagant assumption, that the whole of these forty grains of sulphnr would be completely burned—and, in reality, they would be burned very incompletely—they would furnish, by their combustion, eighty grains of sulphurous acid gas. This quantity of the produced sulphurous acid would occupy, at ordinary temperatures, about one-fifteenth part of a cubic foot, and since one hundred cubic feet of our coal gas gives one-fifteenth of a cubic foot of sulphurous acid, one thousand five hundred cubic feet of coal gas would be required to furnish one cubic foot of the acid, even upon the extravagant assumptions we have purposely made. But the combustion of one thousand five hundred feet of coal gas would produce something besides sulphurous acid. It would produce at least one thousand cubic feet of carbonic acid, and, in addition to its dilution by other gases and vapors, we should have our sulphurous acid diluted by one thousand times its volume of carbonic acid. Now, if we can get at the proportion of carbonic acid in the atmosphere of a room highly illuminated with gas, and take the thousandth part of that proportion, we shall be able to form some notion of the amount of sulphurous acid present. You will remember that the amount of carbonic acid furnished by the breath of one individual, is equal to that furnished by two three feet gas burners, and that the maximum amount of carbonic acid found in the atmosphere of a crowded theatre was 0.32 per cent. Now, if in addition to our previous unreasonable suppositions, we further suppose that an atmosphere contains 0.2 per cent. of carbonic acid furnished by gas combustion, you will see that the whole matter becomes a *reductio ad absurdum*—that we might actually have one-half millionth part of sulphurous acid present in the air of a gas-lighted room."

I think that the facts and opinions here quoted effectually dispose of the second objection to oxide of iron purification. It may seem that I have said more than was necessary on the comparative merits of the lime and iron processes of purification, but a perusal of the testimony given during the hearing before the Board, will recall the fact that the evidence of the experts, called by the Metropolitan Gaslight Company, was almost entirely confined to this question. In fact, the only defence offered was the alleged total failure of the iron processes and the consequent unavoidable use of lime.

HISTORY OF THE GAS NUISANCE.

For years the citizens of New York have complained of a peculiarly offensive smell, which was perceived throughout the city to a greater or less degree, according to the weather. This smell was noticed at particular hours of the day, and pervaded large districts, making it impossible to open the windows during its prevalence. By many this smell was attributed to the gases from the sewers, but it was easily demonstrated that the sewers did not, as they do not now, send out offensive gases. The enormous quantities of Croton water used throughout the city make it impossible for the sewers ever to become specially offensive. The smell was peculiar, and was recognized at once by every chemist, and by every one familiar with the manufacture of gas, as the smell of the foul lime which had been used for purifying gas.

The first special complaint against a gas company that I find on record, is that of Dr. E. H. JONES to the Board of Health, against the Manhattan Company, dated April 24, 1866, and printed in the annual report of the Board for that year. The subject was at that time referred to the Sanitary Committee. On the 30th of April following, a Committee of the Citizens' Association conferred with the Sanitary Committee on the subject; Professor R. E. DOREMUS and Professor SAMUEL ST. JOHN appearing as members of the Citizens' Committee, and the Gas companies being represented by some of their officers. As a result of this conference, the Manhattan and New York companies at once turned their attention to the subject, and sought means to prevent the nuisance which they admitted to exist. Nor were their efforts in vain. The Manhattan Company made a number of experiments, with a view to destroying the foul gases of the refuse lime, and finally introduced the ventilating process, which I have already alluded to, and which, with the improvements recently introduced, seems to effectually remedy the nuisance. The New York Company was equally active, and after considerable investigation, decided to give up lime purification altogether, and very judiciously introduced the oxide of iron in its place. Thus the largest companies on the island, which supply all the gas consumed below Thirty-fourth street, promptly responded to the suggestions of the Sanitary Committee, and removed the cause of complaint. As these two companies manufacture four-fifths of all the gas produced on the island, and own all the gas-works situated below Forty-first street, a great improvement was at once noticed.

The Metropolitan Company, however, which supplies gas to that portion of the city between Thirty-fourth and Seventy-ninth streets, paid no heed to complaints of the citizens, but continued to send out the odors of foul lime. As this company does not manufacture more than one-fifth of the gas supplied to this city, the nuisance was not, however, as general as before. The works are situated at the foot of West Forty-second street, and the odors are often blown westward, away from the island. In certain kinds of weather, however, the smell was diffused throughout the city, and complaints were not rare. Some attempts were made to coerce the company, but all responsibility for the smell was stoutly denied by the officers. The members of the Board of Health were on the alert, with a determination to compel the offending parties to follow the example of the other companies.

On July 5, 1868, Dr. STEPHEN SMITH, Sanitary Commissioner, and Dr. ELISHA HARRIS, Sanitary Superintendent, noticed the unmistakable smell of foul lime in Thirty-fourth street. They consulted the neighboring vanes, and found that the wind was blowing from the northwest, and walking in this direction, guided by the odor, they came to the Metropolitan Gas Works, in West Forty-second street, when they found that a purifier had just been emptied, and the pile of foul lime was still warm and reeking with offensive gases. When these facts were reported to the Board of Health, an order was at once issued, dated July 14, declaring the manufacture of gas at the foot of West Forty-second street to be a nuisance, and ordering the same to be discontinued, except it be conducted by a process that will not allow any deleterious gases or odors detrimental to health to escape into the external air.

Mr. ZOLLIKOFFER, the President of the Metropolitan Company, at once requested an opportunity to be heard in defence of the company; and on August 10th he appeared by counsel and showed by his witness that he employed the best coals and purified by the best process, and that the gases evolved by the foul lime were anything but unhealthy—were, indeed, a specific for the whooping-cough and other diseases. The attorney for the Board of Health showed by his witness that the purification, as conducted by the Metropolitan Company, was necessarily a nuisance, but one that could be easily avoided by following the example of either of the other city companies. The hearing was then adjourned to August 13. On that day the counsel presented a memorial from the gas company signed by the president. In this they first plead the inexperience of youth, the company being the youngest on the island. They then state that they never heard it even suggested that purification by dry lime was in any way offensive till they received the order of July 14. This is a somewhat remarkable statement, inasmuch as every book on gas-making admits the nuisance, and since the other companies had, two years previously, in response to the Board of Health, investigated the matter and made the necessary changes, all the particulars having appeared in the daily papers from time to time.

Further, while they protest against the adjudication of the Board of Health that their process of purification is a nuisance, they avow their willingness to try any method which science may suggest, and experiment demonstrate to be a better one than that which they are using. And finally requesting that the hearing be postponed until March 1, 1869, that they may experiment on improved methods of purification. The Board finally consented to a postponement of several months.

On February 6, 1869, the hearing was resumed. The gas company had enjoyed a respite of nearly six months for this special object, and on a distinct, written promise of making experiments; and had not actually made a single experiment during the entire period. One thing only had been done—they sent a man to Europe to learn what processes of purification were in use there. He had returned, but great care was taken when the hearing was resumed not to put him on the witness stand, for his written report was a complete confirmation of all that had been claimed by the witness for the Board of Health with regard to the improved processes of purification there, and for preventing nuisance. What did the Metropolitan Company do then, after making written promises and saying so much about good faith, etc.? They made no experiments; did not follow the advice of the man they had sent to Europe; did not do what either of the other New York companies had done to mitigate the nuisance, but at the end of six months appeared by counsel, with distinguished chemical experts, to defend the stench-producing method of purification. For several days the hearing was continued, and nearly two hundred printed pages of testimony taken.

I will do justice to Professor SILLIMAN, who was called to testify by the gas company, by stating that while we differed as to the expediency of introducing iron purification instead of lime, he stated clearly and unequivocally on the cross-examination that the process of purification, as conducted by the Metropolitan Company, was necessarily a nuisance, and that by using simple precautions this nuisance could be avoided. This was all that the Board of Health was called upon to prove, and the admission of this by their own witness was evidently understood by the gas company as equivalent to losing their case. So they presented another memorial, or, rather, a set of resolutions, in which they again proposed to experiment. This was on March 4, and the hearing was then postponed till March 22, the company solemnly stipulating to introduce and test the iron or some other improved process.

When the 22d of March arrived, the company again made excuses. "In order to introduce the iron process, it was necessary to place false bottoms of perforated plank in the purifiers, and there was only one man in New York who could bore the holes, and he had been busy boring the holes for some one else." Still, the patience of the Board of Health held out, especially as a prompt enforcement of the order of the 14th of July might have thrown into darkness all that portion of the city lying between Thirty-fourth and Seventy-ninth streets. Finally, the gas company actually began to experiment, but in a very original way. They engaged a man to make a soap with which to wash the smell out of the foul lime. A considerable quantity of it was used, and the members of the Board of Health and several other gentlemen were invited to witness the success of the operation. But the soap did not answer; it was tolerably effective on the upper layer of foul lime, but left the lower five or six layers as offensive as ever. At last, an iron mixture was procured; not one of those, however, which the messenger to Europe had seen in successful operation, and minutely described in his written report; nor yet the one in use by the New York Gaslight Company, but a mixture which was once used somewhere in New Jersey, and subsequently abandoned—a mixture of Spanish brown, shell-lime, and sawdust. Half the purifiers were filled with this mixture, while the other set was filled with lime, as usual. They went through the motions of using this mixture in half the purifiers during most of the past summer, though the gas was actually purified, I think, by the purifiers containing lime. At all events, the mixture did not work as might have been expected, and this autumn, as soon as the consumption of gas increased, the mixture was thrown out, and the purifiers were again filled with lime. So this company has now gone back to the old process, and in spite of all the evidence to the contrary, and all the time and money expended in bringing out that evidence, it still stubbornly denies the fact that foul lime creates a nuisance, or that any improvements have been made in gas purification.

The offensive process is now in full operation, and more than that, the foul lime is actually used to fill in a pier. This is specially objectionable, as it has already happened, both in London and Dublin, that on making excavations for sewers in places where foul lime had been used for filling in, the workmen were killed by the gases evolved. Five men were killed at one time in this manner in London in 1849.

Such is the history of the gas nuisance in New York, brought down to date.

WHAT THE METROPOLITAN GAS COMPANY MIGHT DO.

This company has probably spent nearly $10,000 for expert fees, counsel fees, sending to Europe the man whose evidence was suppressed, and whose advice was not followed, time of employés, printing 200 pages of evidence, etc., all apparently with the design, not of suppressing the nuisance, but of defeating the honest efforts of the Board of Health in behalf of the citizens of New York. Suppose the officers of this company were really acting in good faith, with a sincere desire to obviate the nuisance, they could at once introduce a better process of purification—a cheaper process, by which they could save $10,000 per annum, or they could retain their present process and let them ventilate the foul lime. Let them follow the example of either of the neighboring companies, use the iron process of the New York Company, or the ventilating process of the Manhattan Company, or they may select any one of the improved iron processes now used in Europe. All that is asked of them is that they manifest the same willingness to direct their efforts to the management of their business in a manner most conducive to the health and comfort of the city, as was so promptly manifested by the other companies.

Applications of the Pentagonal Symmetry of the Terrestrial Globe.

By JULIEN THOULET, E. M., Wilkesbarre, Pa.

IT is now more than twenty years since M. ELIE DE BEAUMONT, the illustrious French geologist, made known for the first time the facts which compose the ingenious theory of the pentagonal net-work, but nevertheless it is only for a short time that applications of this theory have been made to the art of mining. These applications have been numerous. They have been recently in Europe, and may be in America, of great utility in the exploitation of metalliferous or other veins, for every day the advantage becomes more evident which a methodical research offers over the trials made by the miner guided usually by chance, and which generally end only in financial disasters.

It would be easy to cite instances of the value of these synthetical studies. A single one will suffice. In one of the preceding numbers of the ENGINEERING AND MINING JOURNAL may be found a description of the bed of sulphur discovered in Calcasieu, Louisiana, the importance of which is much enhanced by the fact that the United States have actually no other exploitable deposit of this useful mineral. Now the position is clearly marked by the intersection of two circles of the pentagonal symmetry. Sulphur, petroleum, salt, gypsum, and sometimes mercury, are concomitant minerals; the petroleum, whether in the state of oil or in the state of gaseous hydrocarbons, forming the median line, the sulphur (native sulphur, sulphurous springs) will be found always on one side and the salt on the other. This fact is verified in the Carpathian Mountains, at Wielicszka, in Wallachia, in France, in Italy, in Canada, and across the United States—the petroliferous line of which is marked by the beds of Gaspe, of Pennsylvania, of the Kanawha, in Virginia, the mouth of the Mississippi, with its salts and its sulphur, and follows a great circle of the pentagonal network which enters Sweden at the point where petroleum has been found in the granite, and cuts the celebrated bituminous springs of Bakore, on the shore of the Caspian Sea.

That which constitutes the great value of the theory of the pentagonal network is that it is simply the expression of a series of empirical facts. It is a sort of algebraical formula serving to group together all the solutions of the problem, having a mathematical vigor which compensates for the apparent dryness of its first study.

It would take too much space to give here a résumé, even very succinct, of the complete theory of the pentagonal network; those who desire to give this question special study should refer to the works of M. ELIE DE BEAUMONT, entitled: *Notice sur les divers systemes de montagnes*, and *Rapport sur les progres de ea Stratigraphie.*

This French savant, taking the direction of the different European mountain ranges, and referring them to the same point, remarked that they are not distributed equally throughout the whole circumference, but that they compose a series of distinct groups or bundles. He then conceived the idea of assimilating the earth to a sort of immense crystal, and he examined whether the directions given by experience do not play, in relation to a certain regular geometrical figure, the roles of faces, angles, and truncatures of a crystal in relation to the elements of some primitive form like those which serve as bases to the six crystalline systems of mineralogy. He found that this figure was that formed by twenty equal, equilateral spherical triangles, which occupy the entire surface of the sphere, and are grouped in fives about twelve points of the globe.

The meridian lines of these twenty triangles divide each of them into six equal scalene triangles, amounting in number to one hundred and twenty upon the entire sphere, and which can be grouped in different ways, among others, 10 by 10, so as to form twelve equal spherical pentagons. From this the name pentagonal symmetry is derived.

The idea of referring the fissures and elevations produced by cooling upon the terrestrial crust to a geometrical figure involves nothing to shock the mind. These movements are the

results of contraction, having a sensible analogy to those of the basaltic rocks which come out from the interior of the earth, in a soft state, and take in cooling the form of prisms of three, four, and more often of six faces. The regular hexagon is the figure of minimum perimeter for a given surface, dividing a plane without leaving any vacant spaces. On account of the spherical excess, the sphere is not divisible into hexagons, and the fifteen great circles which divide the globe into twelve pentagons enjoy a property of minimum contour which makes this the system of lines most suitable for fractures of the crust.

The circles connected with the pentagonal symmetry are sixty-one in number, viz.:

6 Regular dodecahedric,
10 Icosahedric or octahedric,
15 Primitive great circles,
30 Rhomboidal dodecahedric.

The framework of the globe is formed with reference to these circles, just as with reference to the elements of a cube are formed the elements of the octahedron, dodecahedron, tetrahedron, tevlahexahedron, etc., solids which, with their modifications, are all included in what the mineralogists call the first crystalline system.

Crystallography is an application of geometry to mineralogy; in its largest sense, the theory of the pentagonal network may be defined as an application of geometry to geology.

In all manual and intellectual labor tools are necessary. The tools employed in the study of the pentagonal network are geographical maps constructed in gnomonic projection. If we suppose the terrestrial sphere to be tangent to a plane, the gnomonic projection of each point of the surface will be found by joining this point with the centre and prolonging this radius until it pierces the tangent plane. In this system of projection the meridians are right-lines, and the parallels are represented by all the curves of the second degree—points, ellipses, parabolas, hyperbolas and right-lines—the positions limited by the asymptotes of the hyperbola, each great circle being represented on the map by a right-line, and, reciprocally, each right-line of the map representing a great circle of the sphere. It is well known that upon the sphere, the shortest distance between the two points being an arc of a great circle, it is in arcs of great circles that we should make geodetical constructions; and upon a gnomonic map we can with the rule trace the projections of all the spherical figures connected with the sphere.

I have published the elementary formulæ serving to establish such a proposition, and I have also constructed a great map of the European pentagon, which was presented to the *Académie des Sciences* in the month of February, 1869.

If upon a map of this kind the lines of the pentagonal network are drawn, it is astonishing to see the order which, from apparent confusion, the features of the terrestrial surface assume. The orographic directions arrange themselves just as in the hydrographic system, a direct consequence of the mountain elevations constituting the basins.

Metalliferous deposits are classed in two great categories—veins and alluvial deposits. Now both are adapted in a marvellous way to the great features of the pentagonal symmetry, and are grouped with reference to a small number of right-lines, in such a way that a line drawn through a few of these deposits will pass through a whole series of them.

The fissures of the terrestrial crust coinciding with right-lines, the same should be evident of metalliferous veins, which are only a filling up of these fissures. Water courses are the consequence of elevations; they produced the alluvial deposits, hence these deposits are also strongly constrained to depend upon the pentagonal symmetry.

Thus we see verified, in all their splendor and exactitude, the words of the scripture: "*Nameri regunt mundum.*" The unity of plan is so simple that it becomes one of the causes which prevent the human mind from admitting it at first without hesitation. At the time of the discovery of the laws of crystallography, it was long before the habit could be formed of considering the innumerable forms of mineralogical crystals as dependent only upon six initial forms. To-day these laws are doubted by none, because they are the condensation of facts of experience or observation; before long it will certainly be the same with the pentagonal theory.

At the Universal Exposition of 1867, MM. ELIE DE BEAUMONT and DE CHANCOURTOIS exhibited a detailed geological map of the department of the Haute-Marne; resting upon this remark of WERNER and the German miners, that the faults in which the metalliferous veins are deposited are coördinated among themselves by groups, in each of which all the directions are sensibly parallel to each other, they have succeeded in representing all their observations by sixteen groups of parallel lines; and they have verified this fact, that all the deposits of iron align themselves in accordance with directions agreeing exactly with those of the faults and other geological accidents.

M. DE CHANCOURTOIS has applied the pentagonal network to the coördination of the sources of petroleum and bituminous deposits; M. RIVAT to the lead mines of Vialas and Villefort, France; M. MAISSENET to the mineral deposits of lead in the carboniferous limestone of Flintshire, and to the metalliferous deposits of Cornwall and Devonshire, England. Everywhere experience is found to agree with the theory.

The problem proceeds from the known to the unknown, and is as follows: given a series of points where a mineral is exploited in a country, to find the direction of the richest veins, and generally in what direction new mines can be found, and the points where these mines ought to be most profitable. We arrive at a solution by means of what has been called the *useful angle;* this angle once known, the engineer can direct his galleries boldly, for he is certain that in every other direction his researches can only have negative results.

It is desirable that a good gnomonic map should be constructed for the United States—that country in which mineral wealth is so abundantly distributed; the application of the pentagonal network will render operations still more profitable, and in the words of M. ELIE DE BEAUMONT, it is not doubtful that in the end it will obtain the sympathies of capitalists.

Santo Domingo.

Letter from Professor GABB.

TO THE EDITOR—Sir: My last letter was barely more than a promise that I would write you in the future. I shall now commence to redeem that promise. The most interesting subject being mining, I shall begin with the gold mines and, ignoring the reports or statements of others, devote myself to what I have seen, and to the impression it has made on me.

The gold-producing area of the Province of Santo Domingo is very small as compared with what we know exists on the Island. The mountains of the "north side," for a length of over one hundred miles, are commonly reported to be one continuous gold field, while in the Province, the entire area over which I have seen gold is perhaps twenty miles long and two or three wide, running nearly north and south. A narrow strip or gold country is reported at the heads of the Ocoa and Nizao rivers, and gold is sometimes sold in Maniel, the emporium of that district; but since I have not yet had an opportunity of visiting that part of the country, I pass over it with the mere mention. The gold field of the Jaina, the only well-known one on the south side of the Island, commences near the town of Cobre, on the west side of the Jaina river, about twenty miles from the city of St. Domingo, and extends nearly north on both sides of the river. It is richest about the middle, say thirty miles from the city. Near Cobre, in a stream called the Cuolla, we find the first prospects. From there, all the streams emptying into the Saina from the west side carry down gold. The largest of these is the Mano, a good sized river, in the bars, and on the banks of which, much coarse gold has been washed.

The gold near Cobre seems to have been derived from small irregular veins containing quartz, with so much copper that they have been prospected considerably, with a view to working them as mines of that metal. But the quantity of copper is too little to render them valuable, and an essay of picked specimens only gave me $1 80 of gold to the ton. Further north the copper disappears almost entirely, though much of the quartz on the Sivaná, seven or eight miles to the northward, is stained with silicate and some carbonate of copper. In the arroyos called the Medina and Susua, gold is washed habitually, and with some profit, by the native women; and on a hill adjoining the latter stream, while I was there, a woman dug up, in a field, a rounded piece of gold worth four or five dollars. But it is not until after passing the Sivaná that the quantity of gold is of sufficient importance to make it a prime consideration. Not only does every arroyo carry gold, but between the last mentioned stream and the Mano, the soil on the tops and sides of the hills seems to carry the precious metal everywhere. This is also the case on a tract adjoining this, on the opposite side of the Sainá, called Monte Pueblo, the site of the old Spanish town of Buena Ventura, now in ruins and almost forgotten. Hardly a panfull of dirt can be dug that does not show a color. The tops and sides of the hills are pitted everywhere by old shafts, or rather broad, open excavations, made by the Indians. They evidently mined the dirt and carried it to the water, sometimes a quarter of a mile distant, to wash it in their wooden bowls. There is a goodly area covered with this rich dirt, out of which I have washed as much as thirty or more colors to the pan; but, unfortunately, it is very shallow. To mine it with any hope of profit, the Mano or Saina river must be turned over it by a ditch of several miles in length, and the whole area "ground sluiced." There is not fall enough for "hydraulic" washing, nor a thickness of dirt sufficient so warrant the expenditure; but one day some plan will be hit on whereby the gold will be obtained at paying rates.

The amount of mining heretofore done by the Indians does not sensibly affect the value of the ground. It is not exhausted; and the whole question resolves itself into this: can a white man afford to dig a long ditch and shift his sluices as often as will be necessary under the circumstances? My opinion is that it will pay.

The bars in the Jaina, Maro, and Jivana are doubtless rich, though, so far, they have not been prospected. The gold of the surface and of the arroyos has been washing into them for ages, and has never been disturbed. In the small arroyos, where the bed rock is very near the surface, the women have been washing for centuries, and always obtain good "pay." Why should not the bars of the rivers, into which these creeks empty, pay also?

The supply of water in this region is more than abundant. The Jivana, and several smaller streams in the vicinity, furnish each a good "sluice head," while the Mano and Jaina are large rivers with rapid falls.

Besides the placer deposits, all of the mountainous portion of the Province contains more or less quartz, especially in the eastern part. About the upper Zaina this quartz is gold-bearing, and at least some of the veins are of large size. In the rock, on several outcrops, I have found specks of pyrites; and a number of assays, made in our office, has shown that this variety always carries more or less gold. We have seen no beautiful "specimen quartz;" not even have I seen the rock showing specks or "colors" of the metal. But in every case, analysis shows it, where the quartz contains sulphurets of iron, or the cavities due to their decomposition.

The time is near when the "honest miner" will be prospecting in every gulch; but, the surface washed away, the true mineral riches of the Province will only then be discovered. The beautiful Jaina, now as clear as crystal, will become a second Feather river, with its muddy flood, and its banks will, ere long, resound to the clatter of the stamp mill.

Not the least attractive feature of this region is the accessibility. A pleasant sail of a week brings one to the picturesque old Rip Van Winkle, among towns, Santo Domingo, with its walls, centuries old; its cathedral, old in the times of our great-grandfathers; its flat-roofed houses, and its waving palm trees. From here, five or six hours' riding on a little creole stallion, takes one to the heart of the gold region. And here, reader, let me give you a hint. Do not come here on your first visit during *your* summer months; or if you do, bring a complete rubber suit. That is the rainy season here, and if you should have the luck to be caught in a tropical storm, you'd find it rather moist. But in the months from October to May there is no more pleasant climate in the world. All the house that is really needed here is a roof, sufficiently tight to keep off the rain, and to serve as a shelter against sun and dew.

A stranger here must, for the first few months, be a little careful of his habits. He must avoid getting wet, must be sparing in eating fruit, or in drinking strong liquors, must not expose himself too much to the midday sun, nor sleep in the dews. These are trifling precautions, but they are sufficient to enable a Northerner to acclimatize without sickness, and after that he can judge for himself. With the exception of the liquor part, I have always neglected all of the above precautions, and have never paid the penalty. In the depth of the rainy season I have been on horseback for a week, or, worse still, afoot in the mountains, wet to the skin, slept in the open air, my hammock swung between two trees, with only the open sky above, crossed the broad savannas, leagues in extent, under the hottest suns of the hot season, forded rivers swollen by the rains, in short, have done nearly everything that is called imprudent—not from bravado, but necessity; and I have never had an hour's sickness, or needed a dose of medicine, since I have been on the Island.

I say this, not to boast of myself, but to prove in my own person (and I might add, in that of my assistant, Mr. PENNELL, who has been here longer, and "roughed it" more than I have), that the country is not unhealthy, and that the bugbear "tropical climate" is, like a certain unmentionable gentleman, not so black as it is painted. WM. M. GABB.

St. Domingo, Feb. 5, 1870.

Sprinkling the Streets with Chemicals.

Report of Professor C. F. CHANDLER, Chemist to the Metropolitan Board of Health.

COL. EMMONS CLARK, *Secretary Metropolitan Board of Health:*

SIR—I have the honor to make the following report upon the proposition of MORITZ MARCUS, which was embodied in a communication from him to the Board, and which was referred to me as a chemist. Mr. MARCUS states that he has invented and patented a chemical compound for sprinkling the streets, which consists of chloride of calcium and common salt dissolved in water. Mr. MARCUS claims:

1. That his compound holds moisture, and in so doing solidifies the dust, and that it need not be applied to the streets oftener than once or twice a day.

2. That it renders pavements more durable, and that it will prevent the decay of the wooden pavements.

3. That it purifies the air and removes contagion, while pure water is often injurious to health.

4. That its use will diminish the labor of watering the streets, as our sprinkling with the compound is equivalent to four or five sprinklings with pure water.

5. It costs six cents per pound, and fifty pounds are sufficient for five hundred gallons of water. The labor saved by the less frequent sprinkling required when this compound is used, will compensate for the cost of the material.

These are the claims which the inventor makes for his material. The proposition is simply to use a deliquescent substance to retain moisture in street dust. Chloride of calcium and many other salts have the property of absorbing moisture from the air, which they retain at ordinary temperatures, becoming wet, or even dissolving in the water absorbed to a permanent solution; the term deliquescent describes this property.

The idea of Mr. MARCUS is by no means new; it has come up from time to time, and has been repeatedly shown to be impracticable. The use of chloride of calcium for street sprinkling was suggested more than forty years ago. In 1859 experiments were made in Paris, on the walks and roads of the Bois de Boulogne. It was there found that the effect lasted in dry weather five or six days, but that, as the chloride of calcium cost two cents per pound, and as one-half pound was required for every square yard of surface, the process was too expensive.

In 1862 experiments were again made in Paris, a cheaper, impure variety of chloride of calcium being employed, upon which a government report was published. The material cost one cent per pound, and one pound was required for every square yard of surface at each application. The effect of an application of the material lasted about three days. In dry weather occasional sprinkling with water was necessary. Rain washed the chloride of calcium into the sewers at once. It was found that the use of this substance gave rise to the formation of a black, sticky, bad-smelling mud, very offensive to the public.

In 1864 experiments were again made at Paris, the chloride of magnesium being employed on account of its cheapness. One pound of the material was required for every square yard of surface. It was put on at night, the effect lasting twenty-four hours; the second day a little water was required; on the third day considerable water was required; on the fourth day it was necessary to make a fresh application. The chloride of magnesium cost one-half cent per pound. The expense of sprinkling ten thousand square meters, (a little more than as many square yards) for three days, including labor, material, etc., was, with chloride of magnesium, 111.90 francs, or $30.21;

with pure water, 35.50 francs, or $9.58 ; showing that sprinkling with a deliquescent salt costing only half a cent per pound, cost three times as much as sprinkling with water.

In July, 1865, the Engineer-in-Chief of Roads and Bridges reported :

1. That the use of deliquescent salts is considerably more expensive than pure water for sprinkling the streets.

2. That pure water has the advantage, that while it lays the dust, it cools and moistens the dry air of summer, while the deliquescent salts absorb the little moisture present in the air, making it dry and d sagreeable, without in any way cooling it, and therefore exerting an influence prejudicial to health.

3. They form, with the street dust, a disagreeable, sticky and offensive mud.

4. They can be used in those places only where they are much cheaper than in Paris, or where the necessary supply of water cannot be obtained.

From these statements it is apparent that the mixture of Mr. MARCUS, costing six cents per pound, cannot be used economically, as the chloride of calcium at one cent was too expensive in Paris, and the chloride of magnesium at one-half cent per pound cost three times as much as pure water.

Mr. MARCUS' other claim, that the mixture of chloride of calcium and common salt will remove contagion from the air, is probably founded upon the supposition that chloride of calcium is identical with bleaching powder, commonly called chloride of lime, which is not the case. They are entirely different substances. Chloride of calcium is not a disinfectant, and does not possess any properties which would warrant its use for sanitary purposes.

Respectfully submitted. C. F. CHANDLER, Ph. D.

MINING SUMMARY.

Quebec and Ontario.

The Montreal *Herald* gives, on the authority of Prof. BELL, the following excellent review of mining operations in these provinces : The greater part of the copper mines have ceased working. The ores containing a large proportion of sulphur have been used to a considerable extent in making sulphuric acid, for the preparation of bleaching powders and other chemicals, in the manufacture of which this acid is employed, the residue of copper being treated separately after the sulphur has been extracted. The want of a sufficient market here has prevented this branch of manufacture from being prosecuted on any extensive scale, but something has been done at Quebec, and it is not improbable that the use of the Sicilian sulphur in the works at London, Ont., may be dispensed with, and some of the Lower Canada ores containing a large percentage of sulphur be substituted for it with advantage. Great part of the ore now sent to the States is used for making superphosphates for the South, the use of which is becoming daily more extensive. Sulphuric acid being, however, the agent for obtaining nearly all the other acids, and being employed in so many different ways, is an article of daily growing importance, and will draw upon sulphurets which are probably the cheapest material that can be obtained for the purpose. The Huntington mine in Bolton, Eastern Townships, has continued in the face of depressed prices to be worked vigorously, about 240 tons per month of ten per cent. ore being sent off to Liverpool and Baltimore. Were a demand to spring up, from 500 to 600 tons a month could easily be sent away. This mine, we have every reason to believe, has been worked with great judgment and ability. The Capel mine has been sending off about 200 tons a month, from sixty to eighty men being employed. Smelting is going on regularly, from thirty to forty tons of 35 per cent. regulus being shipped to Liverpool monthly, the most of the raw ore being sent to the States. The fuel employed for the smelting is partly American anthracite and partly English coke. The Lower Canada mine is working moderately, part of the product being sent to Quebec and part to the United States. In Quebec the Sulphuric Acid Works, the property of the Company, have a considerable capacity, but are by no means worked up to their full capacity. The lessee of the Harvey Hill mine, Mr. James Douglas, of Quebec, has been introducing a new system of working and dressing the ore. A separate hoisting engine has been erected at the mouth of the principal shaft, connected by a tramway with the dressing-house, three storeys high, where the ore falls into a Blake's crusher and passes through two sets of Cornish rollers connected with cylindrical screens. The arrangement is such that the ore from the time it is landed at the bottom of the shaft is never handled till it is delivered, crushed and sized at the dressing floor below, where are two double automatic hatches on Rittinger's plan for dressing the slimes, the whole being constructed on the latest German models. The machinery is nearly completed, and it is said will enable the ore to be treated rapidly and economically, and to dress it up to 25 per cent., the crude ore holding from three to five per cent. on an average. The new process for extracting copper, discovered by Dr. Hunt and Mr. Douglas, which was successfully tried in the mine last September, will, it is reported, be carried on as soon as the dressing machinery is complete, which will probably be in a week or two. A proper furnace and lixiviators have been erected for the process. There are other mines in the neighborhood of Lennoxville working to some extent. On Lake Huron the Messrs. Taylor Bros. have continued to mine copper ore on the Bruce, Wellington and Huron Copper Bay locations. They have employed about 300 men and boys, and exported about 2,800 tons of ore, and retain some on hand. Works are being erected for the reduction, on a large scale, of the poorer ores, and the tailings, by a modification of the Henderson process, and a few tons of metallic copper have been already produced in this way.

At Madoc gold mining is still carried on. The Phœnix (old Richardson) Company of Madoc are sinking a shaft about 200 feet north of the old workings, in the expectation of striking the lead at about 130 feet from the surface. Mr. Dunstan, the manager, has obtained gold in the characteristic carbonaceous matter at a depth of 100 feet in the old shaft. In the Township of Marmora the Severn mine, on lot 6, in the 8th concession, is being worked at a considerable depth. The old Berry crusher is at work at a mine on lot 7, in the 9th concession of the same township, where a few men are employed getting out ore. The Feigel mine, on lot 16, in the 11th concession of the same township, had been worked during the whole year. The stamp mill at this mine has been in more constant use than any other mill in the district. The gold at the above localities is contained in quartz and sulphurets, associated sometimes with calcspar and bitterspar, and at the Phœnix mine with carbonaceous matter. The average yield per ton, so far, has not been high, and it appears that success will depend upon crushing large quantities at a cheap rate. Alluvial gold mining in the Chaudiere region is still confined almost entirely to the Gilbert river, in the Seigniory of Rigaud-Vaudreuil. The amount of gold taken out during the year amounted to rather more than $20,000. Gold-bearing veins continue to be discovered in the same seigniory, and stamp mills have been erected for reducing the quartz.

The Montreal Silver Mining Company have had Mr. McFarland at work again all summer on Lake Superior. In addition to surveying and exploring the Company's locations, he has been engaged in carrying on mining operations on an island in front of the Jarvis location, where he had discovered a valuable vein of silver ore. He has also erected a building and sunk a shaft on the small island in front of Wood's location, Thunder Cape, where he discovered silver last year. Work was to be continued in this shaft all winter, comfortable quarters having been provided for the men and horses on the main land opposite. A number of barrels of silver ore have been sent down from each of the above localities. Owing to some difficulty with the American partners, the Shuniah mine, near Fort William, has not been worked, as was intended, this season. The Thunder Bay Silver Mining Company prosecuted operations with a considerable number of men, and sent down several thousand dollars worth of native silver. They also erected a stamp mill, to be driven by water power, at the mouth of the Current river ; but through some defects in the construction it had not got into successful operation at the close of navigation. Some preliminary trials, however, proved the ore on hand to be rich in silver and easily reduced. Trials have been made of the rich iron and lead deposits, near the shores of Thunder and Black Bays, and extensive operations are contemplated in the spring. The mines of this region are best known to the Americans, by whom it is expected they will be principally worked.

The St. Maurice Iron Works have been carried on as usual with great success by Messrs. John McDougall & Sons, of Montreal, and the Radnor Forges by Mr. LaRue. All the iron that can be produced commands a ready sale at a good price in Canada, particularly in Montreal. A new iron Company—the St. Francis—has been in operation only about a year, and so far with good success. The works are situated at St. Pie de Guire, nine miles from St. Michel, on the Yamaska river, while the two preceding are in the vicinity of Three Rivers. The Moisic Iron Company have discontinued operations for the present, owing, we believe, to some disagreement among the company. In the Hastings region mining operations have been confined principally to iron and gold, the Bismuth and other mines having stopped. The Cobourg, Peterboro' and Marmora Railway and Mining Company have had a large number of men at work at the "Big Ore Bed," on Crow Lake, in Belmont Township, commonly called the "Marmora Iron Mines." The ore is found to improve greatly in depth, being nearly free from sulphur. It is sorted into Nos. 1, 2 and 3 grades—Nos. 1 and 2 being exported to Pittsburgh and Chicago, while the No. 3 ore is retained for the present at the mine.

The main shaft of the Galway lead mine, behind Peterboro', has reached a depth of more than one hundred feet, and a considerable quantity of galena has been produced. The works have been recently stopped, pending a sale of the property. The Company declared a dividend of ten per cent. for the first six months of the year. The Frontenac lead mine has been actively worked. The main drift is upwards of 400 feet in length, and shows galena all along. A trial of the crushing mill was made with the surface ore on hand. The vein averages ten feet in width, the gangue consisting of pure calcspar. The crushing yielded from four to six per cent. of galena in the whole mass. The smelting hearths were run for a short time, and about fifty tons of pig lead shipped. At present work is confined to sinking the main shaft, while automatic dressing machines are being prepared and improvements made in the smelting apparatus. The Gaspé Lead Mining Company have, for the present, discontinued operations for want of working capital. The massive deposits of galena at the Lead Hill location in Black Bay, Lake Superior, are being worked to a small extent this winter.

At Buckingham the Canada Plumbago Company have been steadily engaged in mining, separating and manufacturing the ore. In addition to their mining operations, the company have erected large works, driven by water power, for manufacturing crucibles, stove polish, pencil and other materials, for which a ready market is found. The greater part of the crucibles are sent to New York and disposed of there without difficulty, in spite of a heavy duty. The Dominion black lead prepared here is now extensively used for stove polish, and is put up for retail in a very nice form. For the various operations the works are very complete, sixteen head of stamps being used for preparing the ore, the machinery for preparing the black lead being on the most improved plans.

The petroleum interest in the Township of Enniskillen has been very active during the year. Petrolia is the chief seat of operations. Many new flowing and pumping wells have been sunk. The production has averaged five or six thousand barrels per week. The surplus oil is stored in huge tanks sunk in the stiff clay of the district. Large stills have been erected, and a more perfect process of renfining and deodorizing the oil discovered. Hitherto nerrly all the oil has been consumed in the country, but a foreign market has been found and arrangements have been made to export large quantities. The petroleum is rapidly becoming an important branch of trade in Canada.

The salt wells of Goderich and neighborhood have been very successful as far as quantity and quality are concerned, but owing to the fact that the Americans are allowed to send their salt into Canada free of duty, while we are prohibited from sending ours into the States, the business is not as profitable as it ought to be.

The demand for calcined and land plaster in Ontario is increasing largely, and the gypsum beds on the Grand River, in the neighborhood of York and Caledonia, continue to be actively worked. Recent explorations at the former place have shown the beds to extend over a larger area than had at first been supposed.

The Melbourne Slate Company have been continuously working during the year, at their quarters near Melbourne, Eastern Townships. The Rockland Slate Company in the same township, was, up to mid-summer, engaged in preparatory works for developing the mines. During the season several thousand squares have been made at the two quarries, but we have no information of the number of hands employed. Considerable improvements in the machinery for dressing the slate have been made, although the splitting is still done by hand. The quality of the slates produced in Melbourne is very uniform, and of a high standard ; the color is of a bluish black, which does not tarnish by exposure—and the experience of the last few years shows that as a roofing material slate is not injuriously affected by the climate, a fear which for some time prevented its extensive use for that purpose. Shipments have been made during the past summer and fall to all parts of Ontario and Quebec, and to some extent to the Western States.

We have been unable to obtain any information respecting the operations carried on at Danville in the making of school slate.

The Canada Peat Fuel Company have been engaged during the summer on their bogs at Lapigeoniere, on the line of the Grand Trunk Railway. The machinery used is Hodges' patent, which has been considerably improved, and some further improvements are likely to be introduced next season. Notwithstanding the unfavorable weather last season, the company managed to dry and secure in marketable condition a very considerable quantity of peat, several thousand tons having been sent to market. The same company have a bog at St. Brigide, near Farnham, which is intersected by the Stanstead, Shefford and Chambly Railroad, and on which, we understand, operations will be begun in Spring. One or two other peat companies have been sending fuel to market ; but respecting them we have no reliable information. Peat is being manufactured by the Anglo-American and Ontario Peat companies on the line of the Welland Canal, and their products, besides supplying the local market, are finding their way to Hamilton and Toronto. The price is $3 per ton.

In the neighborhood of Perth, iron ore mineral, phosphate and mica are being worked. The iron occurs principally in the Townships of Bathurst and South Sherbrooke, and the phosphate and mica in Elmsley. Large deposits of iron pyrites occur in the neighborhood and near Brockville, and it is proposed to erect works for the manufacture of sulphuric acid of sufficient strength for the conversion of apatite into superphosphate, which is greatly needed by the farmers in that part of Ontario.

A soapstone quarry is being worked in the Township of Madoc, by Mr. J. P. Cummins, of Brampton.

California.

The following table from the *Commercial Herald* shows the value and destination of treasure shipments from San Francisco during the past sixteen years—from 1854 to 1869, inclusive :

YEARS.	EASTERN PORTS.	ENGLAND.	CHINA.	PANAMA.	OTHER PORTS.	TOTALS.
1854.....	$46,533,166	$3,781,468	$965,887	$294,552	$500,508	$52 015 635
1855.....	28,730,564	5,152,150	889,675	231,207	123,129	45,161,731
1856.....	39,505,294	8,666,289	1,308,652	253,268	573,732	50,667,434
1857.....	35 531,778	9,317,747	2,999,261	410,929	692,978	48,976,662
1858.....	25,801,236	9,265,730	1 916,007	299,275	175,779	47,548,026
1859.....	40,146,497	3,910,930	3, 00,756	279,949	202,990	47,640 462
1860.....	35,719,206	2,672,93[illegible]	3,374,68[illegible]	200,835	278,185	42,925 916
1861.....	32,628,011	4,061,77[illegible]	3,541,27[illegible]	349,760	95,920	40,676,758
1862.....	26,104 035	12,950,140	2,660,754	454,58[illegible]	522,924	42,761,761
1863.....	10,389,330	25,4 7,256	4 926,97[illegible]	2 503,296	505,667	46,071,926
1864.....	13 316,122	31,436,423	7,688,97[illegible]	378,795	686,868	56,707,201
1865.....	20,683,300	15,483,659	6,963,52[illegible]	1,224,845	1,103,832	45,368,227
1866.....	29,244,691	6,522,208	6,527,287	511,550	1,548,457	44,354 363
1867.....	23 355,903	5,811,184	9,031,604	372,552	3,075,141	41,676,722
1868.....	21 468,800	5,312,979	6 193,995	640 000	1,828,021	85,444,396
1869.....	12,459 813	11 841 812	6 487,415	658,182	5,839,865	57,278,117
Totals..	$462,088,166	$167,703,293	$68,050,250	$9,033,526	$17,798,824	$724,495,388

It will be seen that the treasure exports to Eastern ports were $9,013,9 7 less than in 1868, while those to England increased $6,528,-833. To China and Panama our exports were about the same as the year previous ; but to all other ports we sent $1,011,244 more.

COMBINED EXPORTS.

The combined exports, treasure and merchandize, during 1869, as compared with 1868 and 1867, were as follows :

	1867.	1868.	1869.
Treasure exports.....	$41,676,722	$35.444,395	$37,287,117
Merchandise exports.....	22,465,903	22,943,340	20,888,991
Totals.....	$64,142,625	$58,387,735	$58,176,108

MOVEMENT OF COIN IN THE INTERIOR.

The following has been the circulation of coin through Wells, Fargo & Co.'s Express and Pacific Union Express Company for the year 1869, combined. The latter ceased business December 1, 1869 :

	To Interior	From Interior and Coastwise.
January.....	$1,292 619	$1,103,805
February.....	1,078,420	1,135,693
March.....	1 472 102	1,452.514
April.....	1,609,838	984,249
May.....	1,797.435	1,177,279
June.....	2 293 809	1,006,991
July.....	1.6 8,279	1,074,310
August.....	2,183,150	1 181,061
September.....	1,863.291	1,092 960
October.....	2,569,193	1,550 008
November.....	2,110,335	1,001,097
December.....	1,762,704	1,325,578
In 1869.....	$21,821,166	$17,065,473
In 1868.....	15,223,807	9,900 798
Increase.....	$6 597 359	$6,164,675

It will be seen from the foregoing tabular statement, that the movement of coin to and from the interior has been quite active during the past year. During the first nine months of the year the increase in business between the metropolis and the interior, as shown by the movement of treasure to and fro, was nearly five millions of dollars over like transactions for the same period of 1868. Loans and saving societies have been established at various interior points within the past twelve months, and coin has been more concentrated in those localities, furnishing accommodations to farmers and country merchants which could formerly only be obtained in this city, with loss of much valuable time, and at considerable sacrifice. On the 1st of December, 1869, the Pacific Union Express was amalgamated with Wells, Fargo & Co., after a short and sharp struggle, which, at one time, promised to maintain strong competition and affect rates. It certainly did some good, and it is to be hoped that the benefits arising from the opposition will be maintained by the victorious company.

MARKET REVIEW.

The Coal Trade.

NEW YORK, Feb. 25th, 1870.

ANTHRACITE.

We find the market this week in a much better condition, although prices remain the same as last week. The supply in the market is small, and at present coal is not coming in as fast as it is consumed, which cannot last long. The cold weather is stirring up trade in all directions, and of course stimulates the demand. The usual monthly auction sale of Scranton coal took place on Wednesday, 23d inst. Eighty thousand tons were disposed of. The attendance was large and the bidding spirited. Prices, however, ruled lower than those of last month, the average decline being fifteen cents. Chestnut, however, advanced in consequence of an unusual demand for Eastern points, which of late have taken an undue share of this size. Below we give the quantity of coal sold, with the prices obtained for each size, compared with those of last month:

JANUARY.

1870.		Jan. 26.
7,000 Tons	Lump	$4 17½ @ 4 10
12,000 "	Steamboat	4 45 @ 4 20
12,000 "	Grate	4 42½ @ 4 30
10,000 "	Egg	4 00 @ 4 20
24,000 "	Stove	5 00 @ 4 80
10,000 "	Chestnut	4 00 @ 3 87½
75,000		

FEBRUARY.

1870.		Feb. 23.
8,000 Tons	Lump	$4 15 @ 4 05
12,000 "	Steamboat	4 17½ @ 4 02½
12,000 "	Grate	4 20 @ 4 05
10,000 "	Egg	4 22½ @ 4 17½
26,000 "	Stove	4 87½ @ 4 67½
12,000 "	Chestnut	4 00 @ 3 90
80,000		

It will be seen from the table that there was an advance of two cents in Chestnut coal, while the average decline on the other sizes was 16 and 2-5ths; on all sizes 15 and 4-5ths.

There is a widely-spread feeling among those who are well posted, that March 1st will see the men "out." The movement among them this time does not come from the miners, but the laborers, who are making the eight-hour law the excuse. This effort may or may not be successful, but the general uneasiness among the men, the fact that they have had plenty of work and no play, leads to the belief that some movement will shortly be made. Any interruption at the present time will send prices up, on account of the small supply at tide-water. We therefore again advise our friends who have coal to buy to lay in a stock now, as it cannot go lower for any length of time.

In the Retail Trade we note a good degree of activity, though prices remain the same.

FOREIGN AND BITUMINOUS.

The trade in foreign coals though not large is fair, and we quote prices at a slightly lower rate than last week, owing to the decline in gold. We note sales of 450 tons Newcastle gas coals at $9 40 currency, ex-ship.

Philadelphia Coal Trade.

Trade is improving, some few orders being received. Dealers here think the prices at the Scranton sale of this week very good, considering the season and the amount sold. Freights to Boston are $2 50 to $2 75, to Providence $2 00.

Below we give a record of Port Richmond coal shipments for the following years, for which we are indebted to Messrs. Hammett, Neill & Co., of Philadelphia, and to whom we are under obligations for many favors of the kind:

	1868.	1869.
Nova Scotia	4,830 10	5,582 00
New Brunswick	7,830 10	1,677 00
Canada	1,627 10	1,550 10
Maine	91,569 10	81,245 10
New Hampshire	34,082 00	37,432 10
Vermont	146 00	334 00
Massachusetts	883,706 15	878 943 14
Rhode Island	123 275 09	145,400 10
Connecticut	64,466 10	100 155 16
New York	411.598 04	611,457 00
New Jersey	93,498 19	140,629 19
Pennsylvania	176.663 14	206,692 17
Delaware	5,364 00	12,236 18
Maryland	5,118 00	4,876 10
District of Columbia	58.976 15	59,607 10
Virginia	47,354 18	49,827 00
North Carolina	2,781 18	4 360 10
South Carolina	11,873 00	9,381 10
Georgia	6.964 00	7,326 10
Florida	5,015 00	4,057 00
Alabama	2 092 10	2,990 00
Louisiana	3 855 00	1,355 00
Texas	549 00	422 00
California	7.594 10	1,043 00
West Indies	7,218 03	4.470 10
South America	11,119 00	2,523 00
China	847 00	.... ..
Mexico	.... ..	1,380 00
England	55 00	.... ..
Hayti	536 00	.... ..
Alaska	.... ..	1,120 00
Total	2,050,349 05	2,378,078 04

COAL ITEMS.

The Mauch Chunk *Coal Gazette* says the Schuylkill Navigation Company is causing its canal to be dredged out at different points along the line, preparatory to the opening of the season of navigation.

The New York *Tribune*, Feb. 2, says that the Miners' Union have notified the Wilkesbarre Coal and Iron Company that a general stoppage in the mining region will take place on Monday next, and will continue for an indefinite period. The object is to get control of the market by decreasing the supply. They claim to have the co-operation of the anthracite regions, but this is doubted. It is reported that the Lackawanna miners will take part in the suspension.

The following items are from the Mahanoy *Gazette* of last Saturday:

By an explosion of fire-damp in the Norwegian Colliery on Friday, George Lee and another miner were severely burned, the former so severely that he died on Sunday.

John Earley, an industrious, sober, hard working miner was killed at the Philadelphia Coal Co.'s Colliery, No. 1, on Monday last, and buried at Ashland on Tuesday. The unfortunate man was literally cut to pieces, in the breast where he was working, by a fall of coal. He leaves a wife and family.

Myersville Colliery was the scene of another distressing accident on Monday last. Mr. Reynolds, recently employed at the works, was busy oiling certain parts of the machinery at the top of the slope, when his foot slipped and he was instantly precipitated head foremost down the slope, which pitches perpendicularly at these workings. His body never ceased descending until it reached the bottom, and when his mangled remains were extracted, life was extinct.

The *Miners' Journal* of Pottsville, Pa., says that accordicg to the official report, 57 men were killed in the collieries of Schuylkill county from May 1 to December 31, 1869. Thus about one man was killed to every 67,800 tons of coal mined. Ninety-one persons were injured—one to every 42,400 tons of coal. Taking the whole year in the same proportion, it would give 72 persons killed during the year, and 115 injured.

The *Alleghanian*, Cumberland, Md., says in regard to the consolidation movement: "As far as we can ascertain, the weight of public opinion, in the mining regions at least, is against the movement. A great many people look upon it as likely to prove a monopoly, and the miners especially regard it as inimical to their freedom and interests."

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending February 19, 1870, compared with week ending February 20, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R.	39,915	427,638	51,536	464,271
†Schuylkill Canal				
Lehigh Valley R. R.	42,651	415,597	57,567	500.255
Lehigh and Sus. R. R.	18,441	123,284	14,198	128,671
†Lehigh Canal				
Scranton North	9,915	67,665	11,976	84,832
" South	31,294	210,950	36,429	212,203
Penn. Coal Co., rail	16,481	110,561	20,397	123,526
† " " " canal				
Del. and Hudson, rail, N.			8,982	88,140
" " " south			1,096	17,575
Delaware & Hud. Can. N				
" S.				
Shamokin	5,068	49,535	7,482	38,080
Trevorton	485	2,642	691	2,934
Short Mountain	543	3,813		
Lykens Valley Coal Co.	821	4,082		
†Wyoming South				
† " North				
P. N. Y. C. & R. R. Co.			5,615	42,557
Williamstown, Co'y	2,504	10,639	5,111	25,207
Total	163,108	1,432,466	220,069	1,820,251
1870			168,108	1,432,466
Increase week and year			51,961	387,765

* Less coal transported for Company's use and Bituminous coal.

† Closed for the Season.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Feb. 19, 1870, compared with week ending Feb. 20, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	12,206	68,968	9,365	68,606
C. & O. Canal				
H. & B. T. R. R.	4,434	40,575	5,974	24,414
Harrisburg & D.			7,299	68,758
L. V. R. R.		552		2,559
P. & N.Y.C. & R. R. Co.			3,543	37,457
	16,640	130,095	26,181	201,794

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending Feb. 19, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	51,536 10
Previously this year	416.735 02
Total	468,271 12
Same time last year	426 580 00
Decrease	41,691 12
Amount sent same week 1869	39.312 00

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, February 17, 1870:

From St. Clair	29,148 19
" Port Carbon	4,718 19
" Pottsville	53 06
" Schuylkill Haven	8,451 19
" Auburn	1.5 2 09
" Port Clinton	7,504 13
" Allentown and Alburtis	96 06
" Harrisburgh and Dauphin	7,299 11
Total paying freight	58,736 01
Coal for Company's use	2,011 17
Total for week	60,847 18
To same time last year	563,807 11
Total	564,655 09
To same time last year	477,413 17

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending Feb. 19, 1870:

	Tons.
For week	7,2-9 11
Previously this year	61,458 18
Total	68,758 09

Report of Coal Transported over Lehigh and Susquehanna Railroad.

Week ending February 19, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons ct	WEEK, 1869. tons ct	YEAR, 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	11482 02	10036 11	91080 00	72034 13
Upper Lehigh Region	902 12	3743 04	4851 03	23558 13
Hazleton Region	261 05	248 02	814 16	1078 02
Mauch Chunk Region	1462 00	4413 08	29925 13	31612 12
Totals	14197 19	18441 05	126671 12	128284 00
Increase			3612 08	
Decrease	4243 06			
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	13029 18	16676 08	121069 04	117350 01
Delivered at and above Mauch Chunk	637 06	609 01	4284 10	4903 03
Delivered to L. & B. R. R. at Plymouth Bridge	470 15	557 09	1317 18	3753 02
L. V. R. R. at Sugar N.		538 07		3272.14
Totals	14197 19	18441 05	126671 12	128284 00
Of the above there was from Company's Mines	2770 14	4413 08	38598 01	32612 12
Increase			2985 09	
Decrease	1642 14			

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, February 19, 1870.

	WEEK.	SEASON.
North	43,858 02	281,821 05
South	1,094 19	17,574 17
Total	44,952 12	299,396 02
Corresponding time in 1869.		
North	40,608 02	259,861 01
South	1,593.15	9,118 14
Total	42,201 17	268,979 18
Increase North	3,250 00	Increase 21,960 00
Decrease South	499 05	Increase 8,456 03
Total Increase	2,750 07	Increase 30,416 04

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending February 19, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	5,615 02	40,942 01	46,557 03
Bituminous	3,543 00	33,914 00	37,457 00
Total, Ant. and Bit.	9,158 02	74,856 01	84,014 03

Report of Coal Transported over Lehigh Valley Railroad

For the week ending February 19, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREVL'Y. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	12,579 12	109,458 13	121,988 05
" Hazleton	31,313 08	259 915 12	291,229 01
" Upper Lehigh	134 17	230 05	365 02
" Beaver Meadow	8,077 10	95,139 16	103,217 06
" Mahanoy	5,458 12	57,569 06	63,027 18
" Mauch Chunk		427 18	427 18
Total Anthracite	57,563 19	532,491 11	590,255 10
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.		2,559 00	2,559 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	57,563 19	535,250 11	592,814 10
Same time last year	42,651 09	416.149 12	458,801 01
Increase	14,912 10	119,100 19	131,013 09
Decrease			
Forwarded East from M'h Chunk by rail	49,814 13	476,750 11	526,565 04
Same time last year	41.358 07	389.987 08	431,345 15
Increase	8,456 06	86.763 03	95,219 09

RECAPITULATION.

Forwarded East from M'h Chunk by rail	49,814 13	476,750 11	526,565 04
To N. C. R. R., at Mount Carmel		115 00	115 00
Forwarded North from L. & B. Junction	5,615 02	40,577 14	46,192 16
To L. & S. R. R. at Packerton for rail	188 13	1,141 01	1,329 14
Delivered at M'h Chunk	32 03	238 11	270 14
Delivered on line of road above Mauch Chunk	214 00	2,461 04	2,675 04
Delivered above M. Chunk for use of L. V. R.R.	1 699 08	10,752 01	12,451 09
To L. & S. R.R., at P'n Hav., for railroad			
Do. for canal			
At M.Chunk for canal		655 09	655 09
Total Anthracite	57,563 19	532.691 11	590.255 10
Bituminous Coal		2 559 00	2,559 00
Total all kinds	57,563 19	535 2'0 11	592 814 10

Cumberland Coal Trade.

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, Feb. 10, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870		9,364 15	9,364 15
1869		12,206 05	12,206 05
Increase			
Decrease		2,811 10	2,811 10

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870		68,606 12	68,606 12
1869		88,968 07	88,968 07
Increase		20,361 15	20,361 15
Decrease			

B. & O. RAILROAD.

The shipments over the Baltimore & Ohio Railroad for the week ending Feb. 19, 1870, were as follows:

From Georges Creek via Piedmont.	Tons.
Consolidation Co	1,799,11
Borden Co	550 13
Midlothian Co	704 15
Hamp. & Balt. Co	145 06
From Eckhart R. R.	
C. C. & I. Co.	735.10
Total	3,330.09

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

	AT NEW YORK, Feb. 24.		AT PHILADELPHIA, Feb. 24.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$- —	$- —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	3 75 to 4 25
Egg	— —to— —	— —	— —	4 00 to 4 25
Stove	— —to— —	— —	— —	4 50 to 5 00
Chestnut	— —to— —	— —	— —	4 00
Pea	— —	— —	— —	— —
LEHIGH.				
Lump	5 75	— —	— —	— —
Broken	5 50	— —	— —	— —
Egg	5 50	— —	— —	— —
Stove	5 75	— —	— —	— —
Chestnut	5 00	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 6 50		— —	— —
New England	" — —		— —	— —
Locust Dale	W. A. 6 00		— —	— —
Honey Brook, Leh	W. A. 4 50 to 5 25		— —	— —
Spring Mountain	" 4 50 to 5 25		— —	— —
Sugar Creek	" 4 50 to 5 25		— —	— —
Sugar Loaf	" 4 50 to 5 25		— —	— —
Old Comp'y's	" 4 50 to 5 25		— —	— —
Cross Creek	" 4 50 to 5 25		— —	— —
Enterprise	" "		— —	— —
Girardville	" "		— —	— —
McMichael	" "		— —	— —
Shamokin	" "	5 50	4.75	— —
Lykens Valley	" "		— —	— —
Broad Top	" "		4 00	— —
Hill & Harris	" "		4 50	— —
Henry Clay	" "		4 50	— —
Powelton	" "		4 50	— —

Prices for Coal at Mauch Chunk.

	F. L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 00	$3 25	$3 25	$3 25	$3 75	$3 00
Wilkesbarre	3 00	3 25	3 25	3 25	3 75	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein	f.o.b. at Phila.	$5 25
Lemon	" "	5 00
Cumberland C. & I. Co.'s on board	N. Y.	7 50
Central C. & M. Co.'s	"	7 50
Consolidated Coal Co.'s	"	7 50

[*Dealers in these coals may be found in our advertising columns.]

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at N. Y	— —	— —	— —	— —	— —	— —
Lackawana at Weh'kn.	4 65	4 70	4 80	5 00	5 40	4 60
Wilk'b're at Hoboken.	4 75	4 75	4 75	4 75	5 25	4 50
Old Co. Lehigh at Pt. Johnston	5 50	5 00	5 00	5 00	5 25	4 50
Lehigh at E. Port	5 25	5 00	5 00	5 00	5.25	4 50

For freights to different points, see "Freights."

Prices of Foreign Coals.

March, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 9 50@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	14 00@16 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs., delivered.

Prices of Gas Coals.

March, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 43 Pine st., N. Y.

Duty, $1 25.

	Coarse. Gold.	Slack. Gold.
Block House	$1 75 @- 75	
Gowrie	1 75 @- 75	
Lingan	1 75 @- 75	
Sydney	2 13½@- 71½	
Pictou	2 13½@1 18½	
Little Glace Bay	1 50 @1 00	
Caledonia	1 50 @- 75	

AMERICAN.

	Coarse. Currency.	Slack. Currency.
Westmoreland Co	— — @- —	
Despard Coal Co	$8 50 @8 00	
Penn	— — @- —	
Newburg Orrel Gas	8 50 @8 00	
West Fairmount Gas Coal	— — @8 00	

AT PHILADELPHIA.

Powelton $7 50

Prices at Baltimore—March, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$6 00@6 75
Pittston and Plymouth	6 00@6 50
Shamokin Red or White Ash	6 00@6 25
Lykens Valley Red Ash	— —@6 50
Yerba Valley	6 00@6 25
Trevorton, Red Ash	6 00@6 50
By retail, all kinds per ton of 2240 lbs.	7 25@8 50
Georges Creek & Cumberland f. o. b. at Locust Point for shipping	— —@5 00
West Fairmount Gas f. o. b.	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

March, 1870.

George's Creek and Cumberland f. o. b. for shipping $4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$- —@- —
Lykens Valley	- —@- —
Shamokin Red or White Ash	- —@- —
Trevorton and Yebra Valley	- —@- —

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven	$2 00

From Port Carbon, 8 cents per ton more.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 19
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 35

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R. R.	81
R. & D. R. R.	1 28
Cam. & Am. R. R.	
Shipping Expenses,	25
Total	$2 34

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	95
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2

Freights.—MARCH, 1870.

TO EASTERN PORTS.	From Philadelphia.	From E. Port and Port Johnston.	From Newburg.	From Rondout.
Stamford	$2 00	$1 10	$	$
Norwalk	2 25	1 00		
Bridgeport	2 00	1 00		
New Haven	2 25	1 00		
Hartford	2 75	1 50		
New London	2 00	1 25		
Norwich and Sou	2 00	1 40		
Mystic	2 00	1 40		
Stonington	2 00	1 40		
Sag Harbor	2 00	1 40		
Bristol	2 00	1 40		
Newport	2 00	1 40		
Fall River	2 00	1 40		
Providence	2 00	1 40		
Dighton	— —	— —		
Warren	— —	— —		
Pawtucket	2 25	— —		
New Bedford	2 25	1 40		
East Cambridge	3 00	2 00		
Salem	3 00	2 00		
Newburyport	3 10	2 00		
Portsmouth, N. H.	3 35	2 15		
Rockport	— —	— —		
Saco	3 00	2 25		
Portland	3 00	2 00		
Bangor	3 00	— —		
Bath	3 00	2 00		
Middletown	— —	1 40		
Amesbury	3 25	— —		
Boston	3 00	2 00		
Cambridgeport	3 00	2 00		
Taunton	3 10	2 00		
Derby	2 00	— —		
New York	1 75	50		
Hackensack	1 95	— —		
Jersey City	1 75	50		
TO RIVER PORTS.				
Troy	— —	— —		
Albany	— —	— —		
Cocyman's	— —	— —		
Stuyvesant	— —	— —		
Cocksackie	— —	— —		
Hudson	— —	— —		
Catskill	— —	— —		
Poughkeepsie	— —	— —		
Fishkill	— —	— —		
Cold Spring	— —	— —		
Haverstraw	— —	50		
Nyack	1 60	50		
Sing Sing	1 60	— —		
Yonkers	— —	40		
New York	— —	— —		
Saugerties	— —	— —		
Rhinebeck	— —	— —		
Rondout	— —	— —		
Tarrytown	1 60	80		
West Point	— —	— —		

Foreign and Provincial Freights.

March, 1870.

Foreign.	
Newcastle and Ports on Tyne	£15@£17 keel
Liverpool	15s. —.do

TO NEW YORK.

Provincial	
Sidney	$3 25
Lingan	3 25
Cow Bay	3 75
Port Caledonia	3 25
Little Glace Bay	3 25

TO BOSTON.

Sydney	$2 75
Lingan	3 75
Cow Bay	3 25
Port Caledonia	3 00
Little Glace Bay	2 25

METALS.

IRON.—Duty: Bars, 1 to 1¼ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1¼ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

Pig, Scotch No. 1, ₱ ton	32 00@33 00	
Pig, American, No. 1	34 00@35 —	
Pig, American, No. 2	31 —@34 —	
Pig, American, Forge	30 —@31 —	
Bar, Refined, English and American	— —@82 50	
Bar, Swedes, assorted sizes (gold)	85 00@97 00	
	Store Prices.	
Bar, Swedes, ord'y sizes, less 5 ₱ ct	120 —@130 —	
Bar, Refined " "	82 50@ 85 —	
Bar, Common " "	— —@ 80 —	
Scroll " "	110 —@145 —	
Ovals and half-round " "	105 —@130 —	
Band " "	105 —@ — —	
Horse Shoe " "	105 —@ — —	
Rods, ⅜ to 3-16 inch " "	90 —@140 —	
Hoop " "	110 —@155 —	
Nail rod, less 5 ₱ ct	— 8—@ 8½	
Sheet, Russia, as to Nos. (gold)	— 11—@—12—	
Sheet, Single, D. and T. Common	— 6¼@— 6½	
Sheet, Galvanized	List 25@30 ₱ cent. discount.	
Rails, English (gold), ₱ ton	57 00 @— —	
Rails, American, at Works in Pa	76 00 @77 00	

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 16 @— 20
English Spring (2d and 1st quality)	— 7 @— 13
English Blister (2d and 1st quality)	— 11 @— 18
English Machinery	— 11½@— 14
English German (2d and 1st quality)	— 13 @— 15
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— — @— 18
American, Spring, do.	— 9 @— 12
American Machinery, do.	— — @— 12
American German, do.	— 10 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 32
Copper Bolts	— @— 33
Copper Braziers, 16oz. and over	— @— 33
Copper Nails	38 @— —
Copper, Old Sheathing, &c., clean	18 @— 19
Copper, Chili Pig	— @— —
Copper, American Ingot	20¾@21 —
Yellow Metal, New Sheating	— @— 25
Yellow Metal Bolts	— @— 26
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1¼ cents ₱ lb; Pipe and Sheet, 2¼ cents ₱ lb.

Galena, ₱ 100 lbs	$— — @— —
Spanish (gold)	6 15 @6 25
German, do.	6 15 @6 37½
English, do.	6 20 @6 37½
Bar (net)	— — @ 8 00
Pipe and Sheet (net)	— — @ 8 00

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	33 @33½
Straits	34 @34
English	30 @—

PLATES.

Fair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ₱ box	$8 25 @8 50	$10 25 @10 75
I. C. Coke	7 00 @7 50	8 75 @ 9 50
Coke Terne	5 75 @6 00	7 25 @ 7 55
Charcoal Terne	7 37½@8 00	9 25 @ 9 87

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign ₱ 100 lbs.	$5 87½@6 12½
Plates, Domestic ₱ lb.	10 @— 12

REMARKS.

IRON.—The demand for Scotch Pig has again subsided. Dealers generally have been well supplied by the recent purchases, and the market closes quietly at the decline noted in our last. We have only noticed sales of 250 tons Eglinton, per steamer, part at $32 50 and part a shade higher. There is very little doing in either No. 1 or No. 2 American, as the bulk of the stock is held above buyers views. We notice sales of 500 tons No. 1, March and April delivery, on private terms. Gray Forge has met with considerable inquiry since our last, and we notice sales of 10,000 tons Glendon in one and two thousand ton lots, at about $31. There is a moderate inquiry for Wrought Scrap; 150 tons No. 1 sold on private terms. The demand for rails has partially subsided, but prices remain firm, 1,000 tons Old Double-Headed, sold on terms we did not learn. Bar is very dull in all situations, but prices are nominally unchanged. Common Sheets may be quoted 4¼@5 cents for Singles, 5¼@5½c. for Doubles, and 6@6½c. for Trebles.

LEAD.—There is rather more inquiry for Pig, though the actual business is small; we notice sales of twenty tons Spanish at $6 17½; and fifty do. $6 25 gold. Bar, Sheet, and Pipe, 8c. net cash.

TIN.—Pig is quiet but held firmly at the advanced rates—say 32@32½c. for Straits, 30c. for English, and 33c. for Banca, gold; fifty slabs Banca and five tons English sold on private terms. Plates continue to move pretty freely, and the late improvement in prices is well supported; sales have been made of 1,000 bxs. assorted Charcoal Tin at $8 37½; 500 tons do. S. T. P. Charcoal Terne, $7 75, gold; and 500 do. ½d X, for forward delivery, at a private price.

SPELTER.—The most of the cheap lots of Silesian having been disposed of, the market is a little firmer, and holders generally demand 6¼@6½c. gold; the demand, however, is very limited, and we hear of no sales.

COPPER.—New Sheathing is steady at 32c., and Yellow Metal 26c. cash. Ingot is still dull, and prices are without improvement; 100,000 lbs. Lake Superior sold at 21c. cash.

ZINC.—American, dry, 7@7½c.; French, dry, 10⅝@11½c.; Sheet, 10@10½c.; Spelter, 10@12c.

MANGANESE—Ox. Manganese, 4½@5c. per lb.

Mining Stocks.

NEW YORK, Feb. 25, 1870.

Mining stocks are depressed, with a small business doing. With the exception of Quartz Hill, our list of quotations show a decline in prices; 100 Smith & Parmelee sold yesterday at $1 65, and 100 Central at 35c.

Petroleum stocks are somewhat advanced this week in many instances; 30 cents is now bid for Bennehoff; Home, $4 @ $5; Central, 66c. @ 70c.

	Bid.	*Asked.*
Bennehoff	30	34
Bergen Coal and Oil	—	—
Buren Oil	20	—
Brevoort	1 00	—
Buchanan Farm	43	46
Central	63	70
Clinton Oil	—	—
Home Petroleum	4 00	5 00
National	—	—
New York and Alleghany	1 50	—
Northern Light	60	—
Pithole Creek	1 50	—
Rathbone Oil	25	—
Rynd Farm	32	34
Second National	—	75
Phillips	—	—
United Petroleum Farms	30	33
United States	70	—

San Francisco Stock Market.

SAN FRANCISCO, February 16, 1870.

(By Telegraph.)

	1st Board.	*2d Board.*
Savage	38¾	—
Crown Point	—	—
Yellow Jacket	49¾	—
Kentucky	94	—
Cholla r Potosi	29¾	—
Gould & Curry	58	—
Ophir	—	—
Alpha	—	—
Belcher	17¾	—
Imperial	26	—
Hale & Norcross	—	—
Amador	—	—

Watt's Great Discovery.

IN order to follow the track of investigation pursued by WATT, it is necessary for the moment to revert to the action of the Newcomen pumping engine. A beam, moving upon a centre, had affixed to one end of it a chain attached to the piston of the pump, and at the other a chain attached to a piston that fitted into the steam cylinder. It was by driving this latter piston up and down the cylinder that the pump was worked. To communicate the necessary movement to the piston, the steam generated in a boiler was admitted to the bottom of the cylinder, forcing out the air through a valve, when its pressure on the under side of the piston counterbalanced the pressure of the atmosphere on its upper side. The piston, thus placed between two equal forces, was drawn up to the top of the cylinder by the greater weight of the pump-gear on the opposite extremity of the beam. The steam, so far, only discharged the office which was performed by the air it displaced: but if the air had been allowed to remain, the piston, once at the top of the cylinder, could not have returned, being pressed as much by the atmosphere underneath as by the atmosphere above it. The steam, on the contrary, which was admitted by the exclusion of the air, could be condensed, and a vacuum created, by injecting cold water through the bottom of the cylinder. The piston being now unsupported, was forced down by the pressure of the atmosphere on its upper surface. When the piston reached the bottom, the steam was again let in, and the process was repeated. Such was the engine in ordinary use for pumping water at the time when WATT began his investigations.

Among his other experiments, he constructed a boiler, which showed by inspection the quantity of water evaporated in any given time, and the quantity of steam used in every stroke of the engine. He was astonished to discover that a small quantity of water, in the form of steam, heated a large quantity of cold water injected into the cylinder for the purpose of cooling it; and upon further examination he ascertained that steam heated six times its weight of cold water to 212°, which was the temperature of the steam itself. "Being struck with this remarkable fact," says Watt, "and not understanding the reason of it, I mentioned it to my friend, Dr. Black, who then explained to me his doctrine of latent heat, which he had taught for some time before this period (the summer of 1764); but having myself been occupied by the pursuits of business, if I had heard of it I had not attended to it, when I thus stumbled upon one of the material facts by which that beautiful theory is supported." When Watt found that water, in its conversion into vapor, became such a reservoir of heat, he was more than ever bent on economizing it; for the great waste of heat involving so heavy a consumption of fuel, was felt to be the principal obstacle to the extended employment of steam as a motive power. He accordingly endeavored, with the same quantity of fuel, at once to increase the production of steam and to diminish its waste.

He increased the heating surface of the boiler, by making flues through it; he even made his boiler of wood, as being a worse conductor of heat than the brickwork which surrounds common furnaces; and he cased the cylinders and all the conducting pipes in materials which conducted heat very slowly. But none of these contrivances were effectual; for it turned out that the chief expenditure of steam, and consequently of fuel, in the Newcomen engine, was occasioned by the reheating of the cylinder after the steam had been condensed, and the cylinder was consequently cooled by the injection into it of the cold water. Nearly four-fifths of the whole steam employed condensed on its first admission, before the surplus could act upon the piston. Watt, therefore, came to the conclusion that to make a perfect steam engine, it is necessary that the cylinder should be always as hot as the steam that entered it; but it was equally necessary that the steam should be condensed when the piston descended; nay, that it should be cooled down below 100°, or a considerable amount of vapor would be given off, which would resist the descent of the piston, and diminish the power of the engine. Thus the cylinder was never to be at a less temperature than 212°, and yet at each descent of the piston it was to be less than 100°; conditions which, on the very face of them seemed to be wholly incompatible.—*Smiles' Lives of Boulton and Watt.*

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col	P. P. Fullerton, 71 B'way	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00	65	
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad	2,500,000	100 00	20	
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					33	38
Consolidated Gregory	Colorado				1 70	1 80
Combination Silver	Nevada			100 00		
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5 000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col	J. P. Davies, 19 Cliff	300,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Beet, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E	H. Adams, 71 Broadway	2,000,000			
Gregory	Colorado		1,250,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		50
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall	400,000			
Grass Valley					27	29
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col	P. P. Fullerton, 71 B'way	1,000,000		10	15
Lander Hill T. & S	Nevada	M.L.Catherwood,74 B'way	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold					1	3
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall	12,000,000		9½	10½
Mariposa preferred	California	do. do.			21¾	22
Montana Gold		G. De Cordova	400,000		3	
Montana M. L. & M. Co	Montana	A. M. Hoyt, 22 William	250,000			
Montrose	Clear Creek Co., Cal	W. W. Perkins, 71 B'way	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall	2,000,000		12	
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way	2,000,000			
N. Y. & Utah P. & M		W. H. Mailler, 108 Wall				
Ophir Gold	Comstock Lode, Nev	L. C. Warner, 70 B'way	625,000			
Owyhee Gold		W. H. Smith, 43 Ex. Place	1,700,000			29
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		57	63
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000		65	70
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00	5	10
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewill, 19 Broad	1,000,000			
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad	2,500,000	20 00	1 60	1 65
Social & Steptoe Con		T. H. O'Connor, 24 Nassau	450,000			
Standard Gold		C. B. Bostwick, 169 B'way	500,000			
Symonds Forks					45	75
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way	300,000			
Wauba Yuma	Arizona	J. W. Silsby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		E. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way	1,000,000			
Cumberland C. & I. Co		E. Kisean, 90 B'way	5,000,000		32 25	33 00
Derby Coal Co		W. S. Davison, 11 Broad				
Dover Coal and Iron Co		L. Chase, 88 Wall				
Del. & Hudson Canal Co		R. H Nerderpol, 7 Nassau	15,000,000	100 00		
Ebervale Coal		G.L Stout, Treas., 111 Br'y	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way	300,000			
Kemble Coal & I. Co		R. A. Wight, 26 Ex. Place	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C	Pennsylvania	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa			1 00	1 50
Mahanoy			400,000	100 00		
McNeal C. & I. Co		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co		G. Wrighton, 34 Wall				
Peekskill Iron Co		W. Murdock, 7 Nassau				
Pennsylvania Coal Co		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co		. B. Smith, 165 B'way	1,000,000			
Scotia Coal Co		. . Soper, 42 B'way	2,500,000			
Spring Mt. Coal		. Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C		. D. Webb, 77 Cedar	600,000			
Stout Coal Co		. S. Comstock, 111 B'way	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		T. T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y	3,400 000		04	
Wyoming Val. Coal Co		E. Potter, 40 B'way	1,000,000			

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper						
Eagle Harbor Copper	Michigan	W. H. Smith, 43 Ex. Place	500,000	25 00		
Evergreen Bluff Copoer	Michigan	F. W. Caper, 44 Ex. Place	500,000	25 00		
Globe Copper		R. K. Rickard, 19 Nassau	200,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine	500,000			
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co		A. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place	1,000 000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000			
Lake Superi'r Silver Lead	Michigan	A. S Kellogg, 22 Pine	1 000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 43 Ex. P	500,000			
Rockland Copper	Michigan	A. Fullerton, 71 B'way	500,000			
St. Joseph Lead	Michigan	J. W. Jones, 6 Broad st	1,000 000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	100,000			
Vermont Copper	Vermont	J. C. Ely, 191 B'way	500,000			
Wallkill Lead, asst		S. M. Pond, 70 B'way				

MISCELLANEOUS.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co		H. Bogardus, 14 Pine				
Quicksilver					14½	15
Covill B. L. M. & M'f. Co		C. R. Bostwick, 302 Pearl	250,000			
Manhattan Marble		H. K. Gates, 70 B'way	300,000			
N. Jersey Zinc Co	New Jersey	A. H. Farlin, 61 Maiden L'e	1,500,000			

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, February 24, 1870, Prof. S. D. TILLMAN in the Chair.

A HYDROSTATIC atomizer was presented for consideration, the invention of Mr. C. H. HUDSON. It consists of two receivers for water, one of which, being filled and placed in an elevated position, is connected with the other by an elastic tube, through which the water flowing displaces the air in the lower receiver, thus furnishing a continuous stream to an atomizer of the ordinary form. Its chief advantage is in giving a constant stream of air at any desired pressure, doing away with an attendant, and relieving the operator from the necessity of continued pumping as in many of the ordinary instruments.

The action of the stream of air in throwing out a stream of the anæsthetic liquid and dispersing it in a cloud of spray, was discussed at some length. The Gifford injector, EWBANKS' experiments on this subject, and various improvements reported to be made recently, were noticed. Mr. EWING gave some facts in relation to condensers for steam engines, which were worked by means of an ejector constructed in the same manner as the injector, but made to throw the water from the condenser. The PRESIDENT remarked that these were not economical methods of working, as much steam being used as would drive a pump doing the same amount of work. The subject was, however, of great interest, and would be discussed at some future time.

A mercurial steam gauge, called the American Eagle steam gauge, was then presented and explained. Its essential parts are a steel diaphragm, plated with nickel to prevent corrosion, and, resting upon it, a column of mercury, which is put in a chamber formed by an upper cover and a steel bottom, and as the pressure acts upon this steel bottom or floor, the mercury is forced up in the tube, and the scale on the guard of the tube indicates the amount of pressure. The diaphragm being some three inches in diameter, gives the mercury in the glass tube above considerable motion. An adjusting screw at the base of the tube gives at once the means of always bringing the column to the zero point, and correcting any variation which may take place. The gauge shows a remarkable accuracy, following the readings of a syphon gauge without variation through the whole length of its graduation.

The first paper for the evening was by Dr. R. P. STEVENS, on the Geology of South America. The subject was treated in a popular way, and the speaker was greeted with applause at different points. Want of room prevents us from giving the paper entire, as we had hoped.

Mr. J. K. FISHER then read a paper on Steam Boilers, and considered at length the fact that comparatively few boilers furnish dry steam. After pointing out that this is due to insufficient water or steam-space, he illustrated a plan of his own for a boiler which should be able to furnish plenty of dry steam. The chief feature of the plan is a number of water surfaces at *different levels*, (eight in number) which would, in the opinion of the speaker, give sufficient room for separating the water from the steam.

The Club then adjourned for two weeks.

Steel and Steel-Topped Rails.

ENGINEER'S OFFICE, KANSAS CITY BRIDGE,
KANSAS CITY, MO., *December* 27, 1869.

TO THE EDITOR: Sir—I notice by extracts from recent discussions in your columns, that fresh attention and interest have lately been directed to the use of steel and steel-topped rails in relaying our railroads.

I have for some years entertained the opinion that all our more important lines of railway would eventually be relaid with mild *all steel* rails; but the question with me, in common with many engineers, has been how to make the change and expense gradual, and how to employ, if possible, the old rails now in the track towards bringing about the substitution.

I made some experiments with this view, some three years ago, which resulted so well that I much regret that I was unable at the time to pursue them further, or even to make them known.

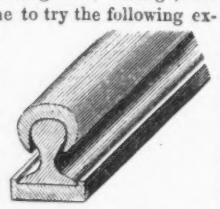
It is well understood that re-rolled rails scarcely ever wear as well as the old stock from which they are made, and in most instances fail in a very short time by lamination. This I attribute to two causes—first, by the present process of cutting up and repiling, we inevitably mix up the different qualities of iron in the old rails throughout different parts of the new rail, and, not being homogeneous, they cannot weld well together; and, second, we squeeze the iron so dry of cinder by the great amount of work and *expense* which we put upon it, that its welding properties are still further impaired.

The rails which have worn best in our tracks show invariably, when taken up and broken, a hard granular head, in some cases puddled semi-steel, a soft fibrous foot, and such gradation of iron between as to weld most readily one with the other. When sent to the rolling-mill, they have but two defects—first, the head is worn and laminated: and, second, the rails are brittle from long use and so-called granulation in the foot. They have already nearly the shape designed for the new rail, and yet we cut them up, and break them down into "flats," and pile them into faggots about eight inches square, to re-roll into a new rail; thus not only consuming about a ton of coal per ton of rails in all the various operations, to heat through so large a mass, and to furnish power to roll it down to one-tenth of its area, but also wasting about fifteen per cent. of iron by oxidation in the furnace and squeezing out of cinder.

I thought that, by treating each old rail separately, it was possible to weld on a new head of iron or mild steel and a new fibrous foot, at less expense, and with better results in the track, than by the present process of re-rolling iron rails.

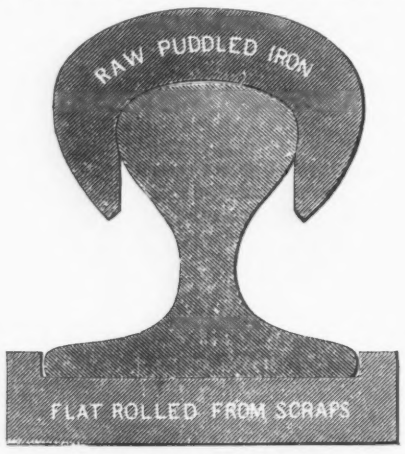
With this view, I experimented both in Chicago and St. Louis; but as mild steel was difficult to obtain, I began with granular iron.

In August, 1866, at the Union Rolling Mill, Chicago, the managers very obligingly allowed me to try the following experiment: Three single pieces of old rails, about four feet long, were charged into a furnace, with new head and foot pieces, as nearly in the manner shown in the cut as they could be shaped by hand; at the time when three ordinary piles had already been withdrawn, and three remained in the furnace, which was burning three tons of bituminous coal in twelve hours.



The single rail piles were brought up to a welding heat in twenty minutes, or two-ninths of the time for an ordinary pile.

The weight of the three ordinary piles in the furnace was eighteen hundred pounds, and the weight of the three single rail piles was four hundred and three pounds. Assuming the consumption of coal to have been in proportion to the weight of iron, the three single rail piles were thus heated with thirty-



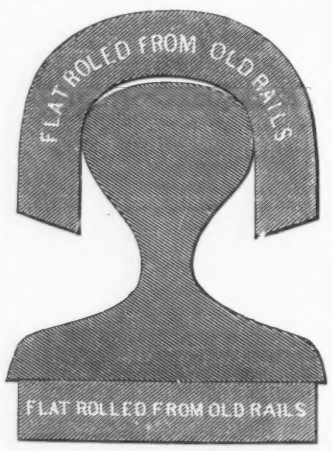
No. 1—Experiment at Chicago.

eight pounds of coal, or at the rate of two hundred and eleven pounds per ton of iron, while the average at the same mill was nine hundred pounds per ton for the ordinary piles, for this part of the process. These single rail piles were re-rolled into three new rails, each about seven feet long, with five passes, instead of thirteen, as usual. Two of them came out well; but the new head of the third twisted around in the first pass, which, being in the ordinary rolls of the finishing train, was of such shape as to be very ill-adapted to wrapping the new head around the old and griping it firmly on the neck. When cool, the new rails weighed three hundred and eighty-five pounds, showing a waste of eighteen pounds, or 4 46-100 per cent., instead of eleven or twelve per cent., as is usual with ordinary piles in this part of the present process.

The fracture was very satisfactory, a perfect weld seeming to have taken place both with the new head and foot, which had been chosen as homogeneous as possible to the iron already in those parts of the old rails.

A similar experiment was subsequently made at the East St. Louis Rolling Mill, with a single piece of old rail, with a new headpiece of iron bent over by hand, and a flat plate for a new foot, as shown in the figure.

The new head 7x13-16 inches, weighed	79½ pounds.
The old rail, 4 feet 4 inches long, weighed	80½ "
The new foot, 3½ x ¾ inches, weighed	39 "
Total	199



No. 2—Experiment at St. Louis.

It was charged by mistake into the wrong furnace, withdrawn, and allowed to cool, then re-charged into another empty furnace, and brought to a welding heat in nineteen minutes. The manager of the mill thought that a deduction of two per cent. should be made from the waste, in order to cover increased oxidation produced by this mistake.

The pile was rolled with four passes into an apparently perfect rail, nine feet six inches long, and weighing one hundred and eighty-four and a-half pounds.

The waste was therefore 14½ pounds, or	7 28-100 per cent.
But if we deduct for waste in the first furnace	2 "
The actual waste was	5 28-100 "

The ordinary charge of the furnace consisted of six piles of five hundred and seventy pounds each, or three three thousand four hundred and twenty pounds; its consumption of fuel being at the rate of five hundred and eighty-five pounds of coal per hour, and the time of heating one and a-half hours, or at the rate of five hundred and seventy-two pounds of coal per ton of iron.

If an equal weight of single rail piles can be heated, in a suitably shaped furnace consuming coal at the same rate, in twenty minutes, it would therefore be heated at the rate of one hundred and twenty-seven pounds of coal per ton of rails. It is probable, however, that the usual result in practice would be about two hundred pounds per ton, as this calculation makes no account of the time lost, and consumption of fuel, which takes place between the charges.

When nicked and broken, however, the new rail showed a defective weld in the head; the new head-piece having slipped around during the first pass, which was made with the rail upright instead of on its side, as would probably be found best in rolls shaped and adapted for this system of piling.

These rough and scanty experiments seemed so promising, and at the same time made it so apparent that success could only be attained with machinery specially designed for the purpose, that I elaborated the various modifications of furnaces, rolls, and tools required for the process, and even went so far as to secure a patent and some caveats to cover them; but since then pressing professional engagements, at a considerable distance from rolling-mills, have prevented me from pursuing them further. Should the apparent results of this process be repeated in practice on the large scale, it would enable our roads not only to re-roll what I believe would be a sounder *all iron* rail, at about two-thirds of the present cost, but it might possibly enable them to transform their old rails gradually into steel, by wrapping them up in new head and foot pieces of successively greater hardness at each re-rolling.

To re-roll with a new steel head, I should propose to charge the old rails upright, into a suitably shaped furnace, say in lengths of about fifteen feet, the battered ends being cut off and rolled into foot-pieces, or a new foot-piece being supplied of such quality as to weld most readily to the old; and, subsequently, to introduce into the furnace and drop upon the head of each old rail a new steel head-piece, when the iron has been brought to such a heat as to arrive at the welding point at one and the same time with the steel. The rolls should be so shaped as to wrap and weld the new head firmly around the old at the first pass. New steel-topped rails could also be made by a similar process; but I should apprehend that the saving would not be great, while the experiments indicate that it would be very considerable in re-rolling.

I shall be glad if you deem this communication of sufficient interest to publish it, and if it will lead some of our practical iron men to confirm or disprove the results of my first experiments.

O. CHANUTE.

The McKay Iron and Locomotive Works.

THEIR NEW ESTABLISHMENT IN JERSEY CITY.

THE concern formerly known as the Jersey City Locomotive Works has been for several years idle. It formerly employed some eight hundred workmen, and was able to turn out six engines per month. On the occasion of a recent visit, we were pleased to find the works, under new ownership, pervaded with new and busy activity.

The present proprietor is Mr. NATHANIEL MCKAY, brother of the well known shipbuilder, DANIEL MCKAY, and formerly engaged in business in Boston, under the firm-name of MCKAY & ALDUS, as a shipbuilder also. Enlarging their establishment to cover the manufacture of various articles required for ships, the firm commenced the building of marine engines, and when the disastrous decline in ship building took place, they turned to the construction of locomotives. Mr. MCKAY has now taken the old Jersey City Locomotive Works, and is preparing to execute all kinds of machine work, still making a specialty of locomotives. Of the old machines, only about ten remain in the shop, but these have had good care, and are in first rate working order. All the designs, and a large part of the patterns, of the former Boston works have been added; and several thousand dollars' worth of new machinery has been purchased from the works of LUCIUS W. POND, Worcester, Massachusetts. This list of machines comprises some twenty planers and forty lathes.

All the work from Mr. POND'S establishment is plain in design, but possesses the beauty of convenient form and thorough finish. There are no unnecessary grooves to gather dirt, nor corners to catch clothes. The foundry connected with Mr. MCKAY'S establishment has a capacity of about eleven tons per day, and every facility for producing all kinds of castings required. The engine (cylinder, 18x48 in.) is about one hundred horse power, and was built at the Taunton Foundry and Machine Company's Works. It has CORLISS & NIGHTINGALE'S variable cut-off, and does the whole work of the shop with thirty pounds of steam. Running at that pressure, it requires one thousand seven hundred pounds of fuel per day. We noted a large hydraulic press, used for putting locomotive wheels on their axles; also one of the largest punching engines in the country. The blacksmith shop has fifteen fires and two steam-hammers.

The main building of the works is about two hundred feet long by eighty feet wide, and two storeys high. The second floor is to be occupied by the lighter machinery, while the lower holds the heavier pieces. Both upper and lower floors have fine light, and are high and roomy, having no partitions or obstructions save the required supports for the floors.

About three hundred men will be employed, and, when the works are in full operation, six engines per month will be turned out. This is as much as the old works accomplished with more than twice the labor—a striking illustration of the advantage afforded by the use of the best modern machinery.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor,

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The Carson City Mint.

THE appropriation for the Carson City mint, in Nevada, has been the subject of a severe discussion in the House of Representatives, in which many of the leading members on both sides participated. The impression produced upon us by the report in the *Congressional Globe* is principally astonishment at the profound ignorance of such subjects manifested by all parties. Mr. FITCH, of Nevada, seems to have had no trouble in confounding the members of the committee who recommended the suppression of the Carson mint, and in forcing them to a sort of admission that they had no clear comprehension of the grounds of their own action.

There is no doubt in the minds of any thinking man, that the Carson mint is unnecessary. If it was required before the railroad was finished, now it has no excuse for existing at all. The government can better afford to receive bullion at its doors, ship it to San Francisco to be refined and coined, and receive it again from San Francisco for delivery to depositors, than to melt, refine, and coin it on the spot. This greater cost of treating the bullion in Carson is what should, and will, destroy the Carson mint. We ought to reduce our mint charges in this country, in order to stop the vast exportation of gold in bars. A man can now make money by sending his gold to Paris for coinage, instead of having it coined in this country. It is imperatively necessary that this should be changed, and hence we should reduce our expenses, that we may reduce our charges for carriage. We should retain as few mints as possible, and those in localities where the work of coinage can be most economically and perfectly performed.

What is the function of local mints? Simply to obviate the necessity of sending vast qantities of bullion a long distance, and returning coin over the same road. But where sparsely populated districts are producing bullion, the coin from which is to be circulated elsewhere, it is a positive loss and nuisance to coin the bullion on the spot. The population of Nevada is perhaps a hundred thousand souls. What do they want with a dozen million silver dollars! If they wish to send dividends to stockholders in the East or West, the remittance can be much more safely and cheaply made in bars. A case occurred in Nevada a year or two ago, illustrating the superiority of this form for shipments of silver. A bar of bullion from the Twin River mill was stolen. As it had been assayed and stamped, it could not be offered for sale without being recognized, and the fineness of the bullion was a characteristic by which it might be known, even after re-melting, unless the laborious and delicate process of parting had been practised upon it. This the thieves had not the apparatus and skill to do; and all chemists and assayers were advertised of the circumstances, so that no one could do it for them. The result was that in a few days the bar was secretly returned to the company.

The process of coinage includes a reduction of the metal to a standard fineness, and then to a standard form. It is positively required by law that the coins of each denomination shall be as nearly exactly alike in size, weight, and fineness, as human skill and care can make them. The form of a coin is, therefore, the worst possible one in which to trace lost or stolen property.

The Carson mint, if it should actively engage in the business of coinage, would simply force the shipment of money instead of bars, and so fasten an inconvenience on the community. Fortunately, this is impossible. The only actual loss is the money paid by the government to support officials at Carson with nothing to do. Next year, probably, the unnecessary character of the institution will be acknowledged by all; and Mr. FITCH, with all his eloquence and wit, will be unable to carry the appropriations again.

The remark of one speaker, that he would rather vote money to the Sutro tunnel than to the Carson mint, was well-conceived. The Sutro tunnel, even as judged by its enemies, is not proved beforehand to be unnecessary and absurd; and this is precisely the category in which the Carson mint stands illustriously foremost.

Dualin.

WE are in receipt of inquiries concerning this new explosive, concerning which we can only communicate such facts as the inventor, Lieutenant CARL DITTMAR, of the Prussian army, chooses to make known. We have not yet examined any of this substance, nor have we seen any accounts of its ingredients or manufacture. Lieutenant DITTMAR, as we learn from a neat circular, has established himself in Boston, as "manufacturer of dualin, xyloglodine, and other explosive mixtures;" and is ready to deliver the new material at prices ranging from 80 cents to $1 50 per pound, according to strength. No. 4, which seems to be strong enough for most uses, is $1 10 per pound.

According to this pamphlet, dualin was first introduced into Germany in April last. In many mining districts, especially in most mines belonging to the Prussian Government, it is now used instead of common powder, and has even taken the place of nitro-glycerine and dynamit (giant-powder.) Of its general properties, it is only told us that dualin is a powder. It is fabricated in six different degrees of strength, the use of which will depend on the degree of hardness and toughness of the material intended to be subjected to the action of the powder. If lighted in the open air, it will burn without exploding; but if confined, it may be made to explode in the same way as common powder. It is not sensitive to concussion; will not decompose by itself, nor cake or pack together, and may be readily filled into cartridges or blast-holes, requiring no other than water-tamping. It matters not whether the place where it is stored be warm or cold, dry or damp. It has from four to fifteen times the strength of common powder, and is, therefore, stronger than nitro-glycerine or dynamit.

Among the advantages claimed for dualin over other explosive agents, is the fact that it may be stored, transported, manipulated, and applied with less risk than common powder. It may also be used in cold weather without first requiring the warming process, which nitro-glycerine and dynamit require, as they frequently become inexplosive at a low temperature. Its explosion does not develop any noxious gases. Absolutely cheaper than either nitro-glycerine or dynamit, it is also relatively cheaper than common powder, for, possessing four to fifteen times the strength of the latter, its use will proportionally reduce the labor and cost of mining and blasting operations. Dualin, when confined, does not necessitate the application of an exploder, but may be exploded by a blasting-fuse, like common powder. Its great want of sensitiveness to concussion renders it a suitable material for the bursting charge of shells. The effect of a dualin explosion is to tear and rend the material exposed to its action, less than to pulverize it, as in the case with nitro-glycerine, when applied to mining and blasting operations in coal and rock. It may be stored for long periods, or subjected to the action of water, without losing any of its strength. Tin cartridges are, therefore, never required, not even for submarine blasting, or blasts where water-tamping is used; and in shipping dualin packed in paper, or thin wooden cartridges, ready for use, the only object is to save the consumer time in charging his blast.

Coal in East Tennessee.

THE great deposits of coal and iron in East Tennessee are now becoming attractive to capitalists, who appreciate their vast value and their security as an investment. In this region progress has heretofore been so slow that, though bituminous coal was known to exist in inexhaustible supplies throughout the entire Cumberland range, west and south of the city of Knoxville, no steps were taken, before the war, to develope extensively the coal trade. Only within the last two years have some of the nearest outcrops been attacked, where the coal was first found and easiest worked. The veins of this coal field lie in nearly a horizontal formation, with a south-east dip in some of the mines, and northwest in others. A careful investigation would show the existence of a main synclinal axis somewhere between the two, to which the smaller rolls now developed in the workings are parallel. Conglomerate sandstone and shale, and a considerable amount of fire-clay, are met with in connection with the coal. There are five workable veins outcropping in this field. The middle one is a four-feet vein, which has been practically and thoroughly tested in the last two years. The others are as yet untouched, and vary in thickness from two feet to six feet. The particular vein now worked is called the four-feet vein, although it varies from two and a half feet to seven feet in thickness where the rolls occur, but otherwise keeps a general uniformity. The openings on this vein are very convenient for shipping coal on railroad cars, being from fifty to eighty feet above the track, which gives the operators every facility for chuting and screening their coal. These mines are now worked by three companies of operators—MCEWEN, WILEY & COMPANY, the Knoxville Iron Company, and WILCOX & COMPANY. These together employ fifty miners, and send away daily from twelve to eighteen cars of coal during the busy season of the year. The cars are of the common gondola pattern and average nine tons each, which gives one hundred and thirty-five tons a day as an average. If sufficient transportion were furnished, this could be increased to four hundred tons a day with the present capacity of the workings. But the increase of the prospective demand of next year will justify an estimate of fully six hundred tons, which will give this class of freight a place commensurate with its importance. Late last year two other parties of operators opened mines on the same vein, nine miles further up, at the present terminus of the Knoxville and Kentucky Railroad.

The coal of this vein is of superior hardness and lustre, and finds great favor as a fuel wherever it is used. It is said to be better than any other in the southern market, being remarkably free from slate and sulphur. A thin layer of slate separates this vein near the middle into two benches of pure coal, called by the miners top and bottom. The slate is easily cleaned from the coal, leaving it in large, solid blocks, varying from a hundred pounds to three or four tons in weight. The appearance of this coal by daylight is more like anthracite than bituminous. The sulphur in it takes the spheroidal form, being scattered in small round grains on the face of the coal at the cleavages. These mines are easily drained, have a good roof, and can be worked at very small expense. The miners get $1 12 per ton (of 2,000 lbs.) mixed coal, and $1 25 for raked coal. Extensive and valuable deposits of iron ore lie in close proximity to these great coal beds. No better sites can be found anywhere for furnaces, and the ore and coal could be handled with very small expense and waste.

Plenty of the best timber and water, to meet all the wants of such an establishment, are found everywhere. The ore of this vein, which traverses the base of Walden's Ridge on the east side, yields sixty per cent. of the best iron. This is made at the Rockwood furnace at a cost of only $15 per ton, which yields a large profit. The fine climate of this country alone renders it a desirable place to settle, without the great attraction which its mineral wealth offers to both capital and labor. Knoxville is only thirty-four hours' ride from Philadelphia, and the passenger can leave New York on Monday morning, and be in the coal and iron regions of East Tennessee on Tuesday night. A through railroad to Louisville or Cincinnati, and to Charleston on the seaboard, will bring these great mineral ranges under the special notice of those who are seeking the means of supplying the pressing needs of the industrial development of the South, and the whole country.

The Origin of Gold.

We are glad to believe that our columns possess some interest for those who are not strictly engineers, or miners, or chemists. Now and then even the fair sex betrays the attraction which science, in its romantic aspects, at least, exerts upon the susceptible mind. When the ladies actually begin, however, to construct theories, gallantry forbids us to say what we think of their workmanship. We must decline, for instance, to inform our correspondent "Minerva" what is our opinion of the following geological flight of the young Mormon poetess, Miss SARAH E. CARMICHAEL, entitled:

THE ORIGIN OF GOLD.

The Fallen looked on the world and sneered,
"I can guess," he muttered, "why God is feared,
For the eyes of mortal are fain to shun
The midnight Heaven that hath no sun.
I will stand on the height of the hills and wait
Where the day goes out at the western gate,
And, reaching up to its crown, will tear
From its plumes of glory the brightest there:
With the stolen ray I will light the sod,
And turn the eyes of the world from God."

He stood on the height when the sun went down,
He tore one plume from the day's bright crown,
The proud beam stooped till he touched its brow,
And the print of his fingers are on it now;
And the blush of its anger forevermore
Burns red when it passes the western door.
The broken feather above him whirled,
In flames of torture around him curled,
And he dashed it down on the snowy height,
In broken flashes of quivering light.
Ah, more than terrible was the shock
Where the burning splinters struck wave and rock!
The green earth shuddered, and shrank and paled,
The wave sprang up and the mountain quailed;
Look on the hills, let the scars they bear
Measure the pain of that hour's despair.

The Fallen watched, while the whirlwind fanned
The pulsing splinters that plowed the sand;
Sullen he watched, while the hissing waves
Bore them away to the ocean caves;
Sullen he watched, while the shining rills
Throbbed through the hearts of the rocky hills;
Loudly he laughed, "Is the world not mine?
Proudly the links of its chain shall shine;
Lighted with gems shall its dungeon be,
But the pride of its beauty shall kneel to me."
That splintered light in the earth grew cold,
And the diction of mortals hath called it Gold.

WE are indebted to the courtesy of Mr. EDWARD YOUNG, in charge of the Bureau of Statistics of the Treasury Department, for the following:

Table showing the quantity and value of several metals imported into the United States during the fiscal year ending June 30, 1869.

Commodities.	Quantity.		Value.
Brass and manufactures of			$296,653
Copper	lbs.	405,329	53,083
Lead—pigs, bars and old	"	85,139,608	3,503,383
Sulphur or brimstone, crude or refined	tons,	23,274	691,251
Tin—bars, pigs or blocks	cwt,	70,337	1,542,692
" plates	"	1,621,599	8,676,381
Zinc, spelter, or tutenegus, in blocks or pigs,	lbs.	13,751,164	626,607
" " " " sheets	"	9,747,189	571,075

Postal Telegraphy—The New English System.

The telegraph lines of Great Britain have recently been transferred to the control of the Post-office authorities, and a number of changes and modifications have in consequence been made in the system, the results of which remain to be tested. The following interesting particulars are condensed from the London papers:—"The transfer was made on the 29th of January, but the actual opening of the new postal telegraph offices took place on the 15th of February. It is expected that under the new arrangement the community will gain largely at once, and very considerably a little later, in three particulars, namely—in cheapness, in extended facilities, and in greater assurance of promptitude, correctness and secrecy. The charge for a telegram of not more than twenty words will be a shilling from any one place to any other place within the Kingdom—the name and addresses of the sender and the receiver being free; and for each additional five words three pence will be asked. Telegrams may be repeated, at the option of the sender, by paying one-half the ordinary cost of delivery by special foot messenger within a mile of the terminal telegraphic station, or within the limit of the town postal delivery of that office, when it is a head office and the delivery extends for more than a mile from it.

The preliminary administrative work has been enormous, and has somewhat checked the development anticipated at starting. But, after all drawbacks have been made, the real improvement is great, as may be inferred from the fact that the fact that the number of telegraphic offices in London and its nearer suburbs alone will be from 200 to 250. The total mileage of wire within the United Kingdom now settled or in immediate prospect, is 66,000 miles, of which 39,000 are on lines of railway, 6,000 miles represent short extensions and 21,000 miles the wires along common roads. The list of post-offices at which messages will be forwarded, transmitted or received, is not yet complete, and will, of course, constantly receive additions. But one rule may be safely laid down for public guidance. Every post-office and pillar-box will be a receiving place for messages. If the sender desires promptitude, he had better direct to the nearest telegraph office, where, besides securing quick dispatch, he can, if he pleases, arrange for speedy delivery; if, on the other hand, he is not particular for an hour more or less, he has only to deposit his message, stamped and directed as a telegram, in the nearest box, and he has no further trouble. The number of hours during which a postal telegraph office will be open will average about twelve a day, say from 8 A. M. to 8 P. M.; but the practice will vary according to the ocality, in some large towns, as Liverpool and Glasgow, offices being open all night, and in others extra hours being given for press messages.

The use of stamps in payment of telegrams is a further valuable feature of the new system. Stamps, of various amounts, from one penny up o five shillings, are to be on sale at all the offices. Forms for messages, singly or in books, are also o be on sale. The enumeration of the number of words is rendered quite unnecessary, by the simple process of dividing each line into five spaces, n e ach of which a word must be written. A marginal note shows the charge for each line. All forwarded messages, whether inland or continental, Indian or American, are to be entered and sent in the order of receipt from the public.

The postal officers are given to understand that the messages are to be regarded as strictly confidential communications, and that any breach of confidence will be visited with severe punishment; they are further enjoined to show no favor or affection in the transmission or delivery of messages. No stranger is to be admitted to the instrument room of any postal telegraph office "without the written authority of one of the secretaries of the General Post Office," and even then he is not to be allowed to go near the instruments while they are at work, or to send the messages. When news telegrams have to be delivered to more than one proprietor of a newspaper or news-room in one and the same town, every exertion must be made to effect a simultaneous delivery, without favor to any one. So jealously, in fact, are the rights of the public guarded, that even messages which are "indecently or obscenely worded, or which appear to contain abusive, libellous, or slanderous matter," must not be refused by a counter-clerk at his own discretion; he must take the opinion of his superior officer, and abide by that decision.

But one all-important point has still to be considered, and that is the sources whence the numerous skilled staff required to undertake so extensive a duty will be supplied. A large and efficient body of operators was transferred from the companies to the Post-office, and, in addition, learners brought by hundreds from various parts of the country have for months been at work with the instruments selected. The postmasters throughout the kingdom, with members of their families, readily acquired the practice of the instruments, and the acquirements of each learner have been rigidly tested by experienced telegraphists employed for the purpose.

A hall in the General Post-office is now used as an instruction school, and there young men and women may be seen practicing all day, singly or in couples; dexterity of manipulation thus attained being followed up by exercise in transmitting messages to one another. The telegraphic instruments to be employed in the various offices throughout Great Britain will be the single needle, the bell, the Morse's printer, the Hughes' type-printer, Wheatstone's automatic instrument and Wheatstone's A B C instrument—the last, however, being retained chiefly for private lines, and seldom for public messages. Wheatstone's automatic and Hughes' type-printing instrument will be in use at none but offices of the first class, and those chiefly used for general transmission will be the single needle, the bell and the Morse.—*N. Y. Evening Post.*

Plating of Fabrics.

THE method of electro-coating paper or other fibrous material, with a metal, consists of immersing, for a few hours, the substance to be covered in nitrate of silver, to which liquid ammonia has been added. After taking it out and drying, it is exposed to a current of hydrogen gas, which reduces the silver to a metallic state, and, of course, furnishes a good conductor. Upon this the metal desired—copper, silver, or gold—may be subsequently deposited in the usual manner.

Stephenson's Cement for Steam Pipes.

IF two parts litharge are mixed with one part dry-slacked lime and one part fine sand, well rubbed together, and mixed with such a quantity of hot linseed oil varnish as to form a pasty mass, an excellent cement for iron steam pipes is obtained, which soon sets hard. Consequently, it must be prepared fresh every time, and applied when still hot.

Stone Coating for Wood.

THE following is a German recipe for coating wood with a substance as hard as stone: Forty parts of chalk, fifty of resin, and four of linseed oil, melted together; to this should be added one part of oxide of copper, and afterward one part of sulphuric acid. This last ingredient must be added carefully. The mixture, while hot, is applied with a brush.

MISCELLANEOUS.

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" (After, or choke damp) composition of
" (Carburetted hydrogen) do.
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines generate a mixture of
Goaf, or gob, how tramrods are made through (plan)
Lund-hill (plan)
Managers, who are best competent to manage mines
Miscellaneous questions
Natural ventilation
Planning, how workings are laid on the plan
Regulations (see R on plans)
Safety Lamps, why flame will not penetrate through, engraving of
Sections on mechanical ventilation
Summary of accidents
Surveying, how mines are with the dial
Surveying, how mines are with the theodolite
Tables of weights and measures
Temperature on surface
Temperature in mines
Temperature, difference of between down and up-cast
Theodolites for mine surveying
Theodolites, how constructed
Theodolites, the magnetic needle dispensed with, and how workings are laid on plan, with Theodolite surveying
Theodolites, how mines are surveyed with them
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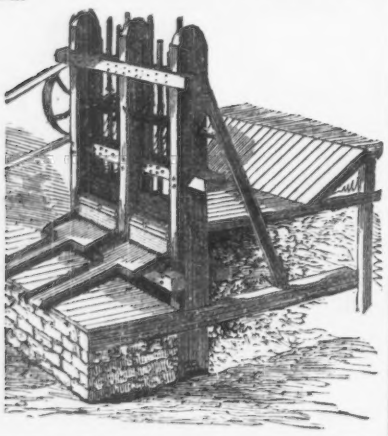

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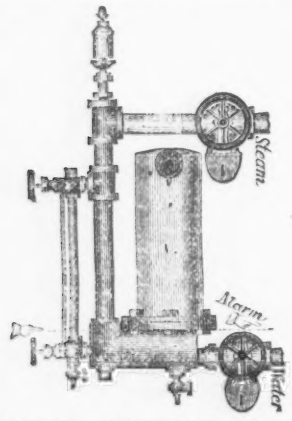

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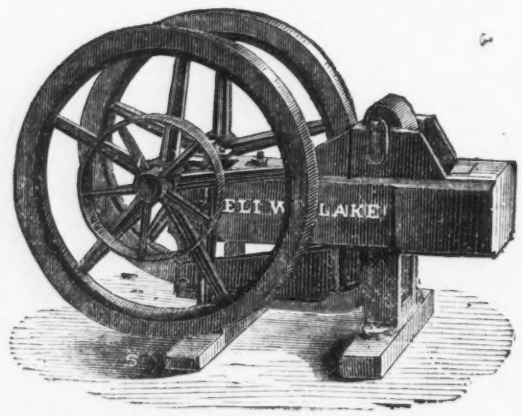

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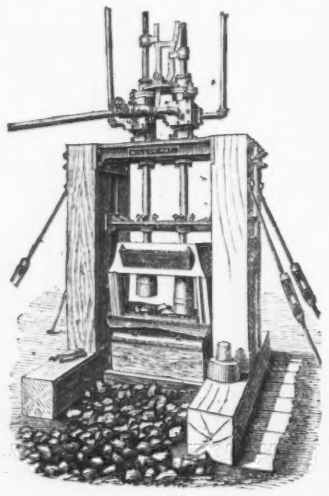

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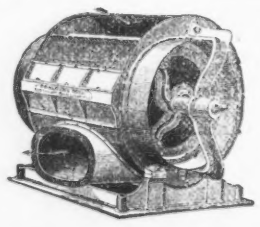

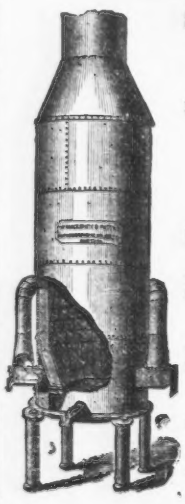

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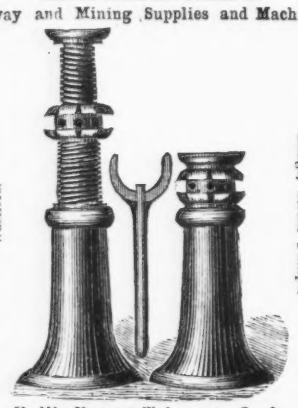

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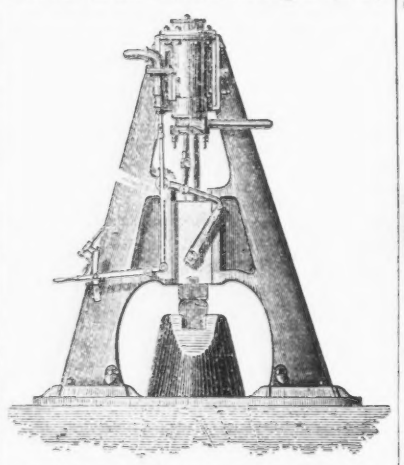

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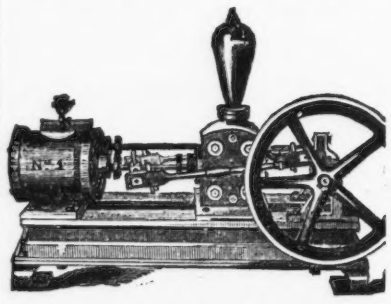

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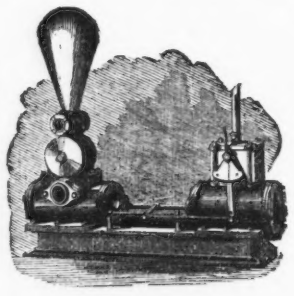

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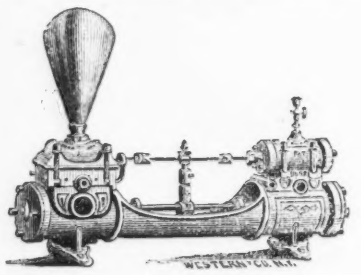

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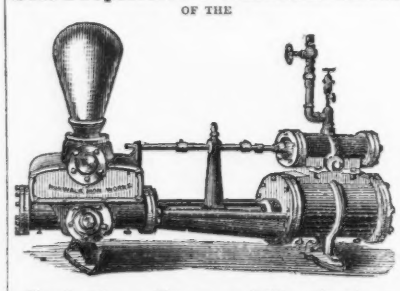

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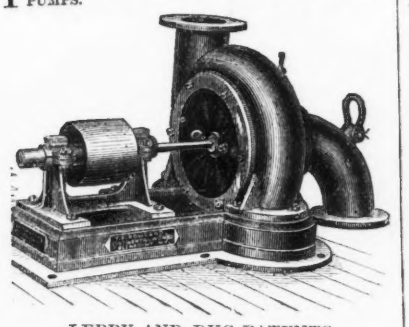

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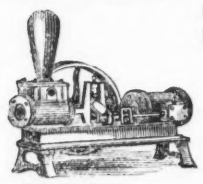

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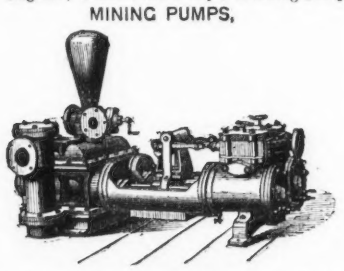

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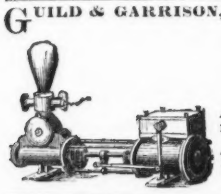

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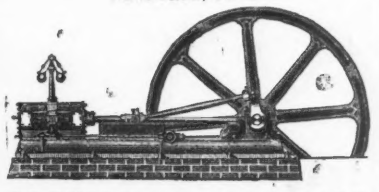

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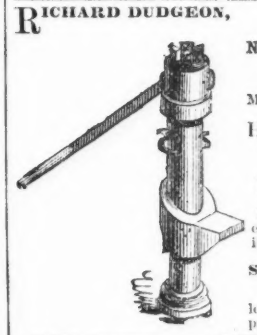

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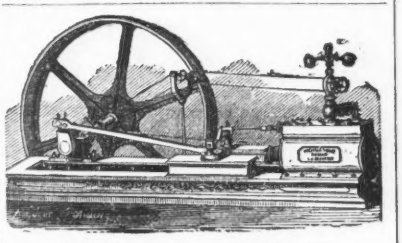

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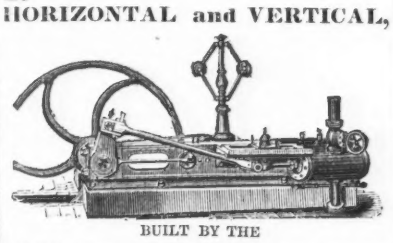

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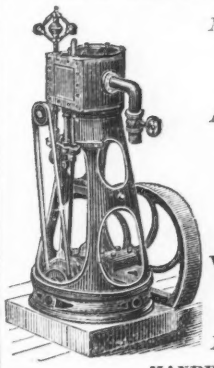

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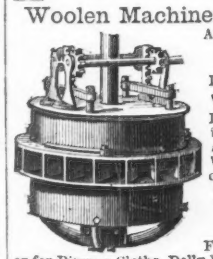

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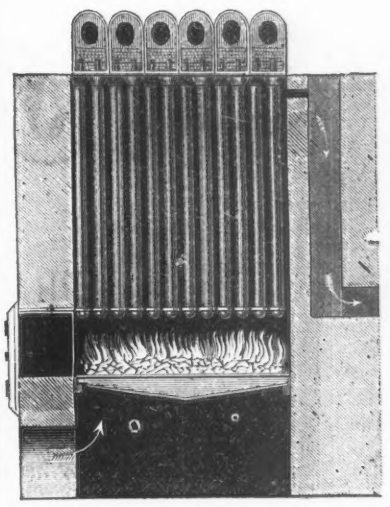

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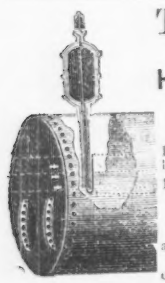

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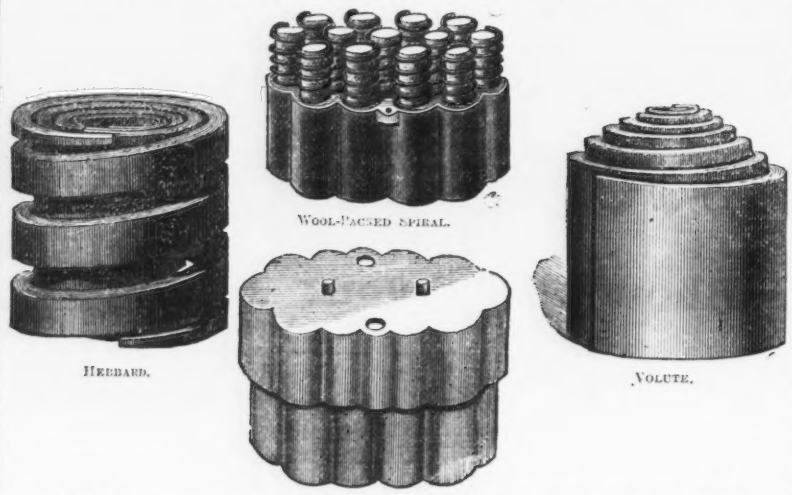

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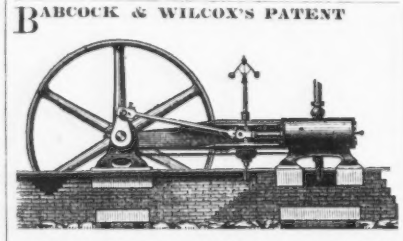

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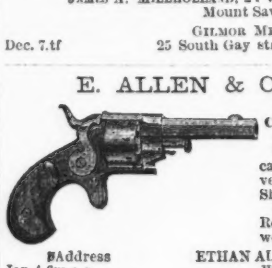

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